For CONTENTS, see page iii and iv of Cover.

pp. 511-570.] [June 15, 1914.

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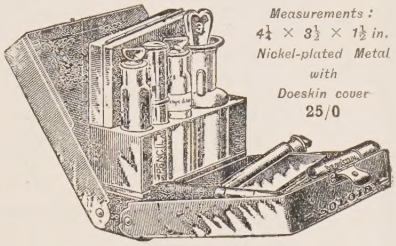

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TROPICAL DISEASES BUREAU.

TROPICAL DISEASES BULLETIN.

Vol. 3.] 1914. [No. 10.

PROTOZOOLOGY.

Noc (F.) & Stévenel (L.). **Flore Intestinale du** *Stegomyia fasciata* **Adulte.**—*Bull. Soc. Path. Exot.* 1913. Dec. Vol. 6. No. 10. pp. 708-710.

The authors, writing from Martinique, give an account of the various protozoa, yeasts and other fungi recorded by previous workers in the intestinal contents of *Stegomyia fasciata.* Noc and Stévenel obtained the following results. Of 30 female Stegomyia that had never fed, nine only had a visible intestinal flora. Two contained a small crithidial flagellate, 3μ to 4μ long and $1{\cdot}5\mu$ to 2μ broad. Others contained yeasts and bacteria. One contained a spirochaete, having the size and appearance of *S. refringens.* A newly-hatched Stegomyia contained a microspirillum.

On another occasion of 11 Stegomyia, having fed on yellow fever patients, or captured in the sickroom, six showed no organisms on dissection, and though bacteria and fungi were present in the other five, no protozoa occurred.

The authors record the above results as they think [and rightly] that a knowledge of the intestinal contents of adult *Stegomyia fasciata* that have taken no food, or have been artificially fed, should precede the study of Stegomyia that have fed on yellow fever patients.

H. B. Fantham.

Laveran (A.) & Marullaz (M.). **Sur deux Hémamibes et un Toxoplasme du** *Liothrix luteus.*—*Bull. Soc. Path. Exot.* 1914. Jan. Vol. 7. No. 1. pp. 21-25. With 14 text figs.

The authors have recently found several haematozoa and a trypanosome in the blood of *Liothrix luteus,* popularly known as the Japanese nightingale, but really a native of China and India. The birds were bought in Paris. Three out of seven had two species of haemamoebae, two in addition contained Toxoplasma, and in one a very few trypanosomes were seen.

The two haemamoebae are :—(1) a small form named *Haemamoeba tenuis,* and (2) a large organism, nearly allied to *H. ziemanni* and *H. majoris,* which has been named *H. liothricis. H. tenuis* was found free but more often intraglobular. The smallest were $\frac{1}{2}\mu$ to 1μ in

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diameter, larger ones 4μ to 5μ long and 1μ broad. Black pigment was present. A karyosome was distinct. Schizogony occurred in the erythrocytes. The host cells were little altered by the parasites. Some melaniferous leucocytes were found in blood smears.

H. liothricis. Sexual forms chiefly were seen; they were spherical or oval, 7μ to 8μ in diameter and were often surrounded entirely or in part by the hypertrophied nucleus of the host cell. They were most abundant in lung smears. Schizogony and schizonts were not seen, but a few young forms were found.

Toxoplasma liothricis was found sometimes free in the plasma, more often enclosed in leucocytes. The organisms were vermicular, had voluminous nuclei and presented great analogy with the toxoplasms of the sparrow and of padda.

The authors discuss briefly the classification of haemogregarines, objecting to the separation of certain of them as Leucocytozoa or Leucocytogregarina, and state that endocellular haematozoa should not be classed according to the cells they parasitise but according to their morphological and evolutionary characters. [They appear to have overlooked the fact that morphology, life cycle and physiological reactions were considered in instituting these groups, not merely the character of the cell. It is tempting to ask why physiological characters may be used in the differentiation of morphologically similar trypanosomes (as has been frequently done), while they may not be taken into consideration in dealing with other blood-inhabiting Protozoa.]

H. B. F.

RINGENBACH (J.). **Quelques Hématozoaires du Congo.**—*Bull. Soc. Path. Exot.* 1914. Apr. Vol. 7. No. 4. pp. 296-299.

This paper contains an account of various observations on an avian trypanosome and microfilaria, and on a Plasmodium of a monkey, made by the author when working on the Mission of Delimitation of the French Cameroons, Equatorial Africa, during 1912 and 1913. The Protozoa only are considered in this review.

(1) The trypanosome, parasitic in a bird, *Bycanistes albotibialis*, is described. It is active in movement, violently displacing the red blood corpuscles. It is relatively large and stumpy, with a large, folded undulating membrane. Its total length is 53μ, the free flagellum being 8μ. Its dimensions differ from those of trypanosomes from other species of Bycanistes, but the author does not consider that it is a different species, as pleomorphism of avian trypanosomes is well known.

(2) A Plasmodium, identified as *P. kochi*, was found in the blood of a monkey, *Cercopithecus cephus*. In the fresh state the parasites showed as spherical bodies, the size of a red blood corpuscle, at the periphery of which spirochaetiform elements were in motion. They behaved similarly to the microgametes of Plasmodium. Stained preparations showed similar structures, and the spherical elements contained brownish pigment and a peripheral nucleus. They are believed to be identical with the microgametocytes of *P. kochi*, well known in African monkeys.

H. B. F.

NAWROTZKY (N. N.). **Hämatoparasitologische Notizen.** [Notes on Blood Parasites.]—*Centralbl. f. Bakt.* 1. Abt., Orig. 1914. Apr. 25. Vol. 73. No. 6. pp. 358-362. With 1 plate.

This paper contains notes on certain protozoal parasites of pike, a haemogregarine of the sturgeon and filariae of the heron and the rook. The fish were obtained from the river Woimiga, in Gawriloff-Possad in the Government of Wladimir, Russia.

Trypanosoma remaki, var. *magna*, was found in the pike. Detailed dimensions of the parasite are given. One specimen was seen in which a second small flagellum was present at the end of the body near the blepharoplast. *Trypanoplasma gurneyorum* also was found in the blood of the pike, both large and small varieties being present. Attention is drawn to the occurrence of a small unstainable longitudinal streak, extending along the body. A possible dividing form was seen. The same pike that harboured trypanosomes and trypanoplasms contained also a new species of haemogregarine, *Haemogregarina esocis*. Endoglobular forms only were seen. The number of parasites in the erythrocyte varied from one to six. The length of the parasites varied from 9·1μ to 11·2μ and their breadth from 6·3μ to 8·4μ.

A haemogregarine from the sturgeon (*Acipenser ruthenus*) is recorded for the first time and designated *Haemogregarina ascipenseris*. [Is there not a misprint in the species name? Apparently *acipenseris* was intended by the author.] The parasites were mostly about 7·6μ long and 1·9μ broad. Usually one haemogregarine only occurred in an erythrocyte and free forms were very rarely seen. Two possible division forms were observed. For comparison with the parasite a table of dimensions of the erythrocytes of the sturgeon is given.

H. B. F.

HETZER (Margarethe). **Studien über Protozoen, insbesondere des Darms.** [Studies on the Protozoa, particularly of the Intestine.] —*Zeitschr. f. Hyg. u. Infektionskr.* 1914. Apr. 1. Vol. 77. No. 2. pp. 304-310.

The first part of the paper consists of an account of work on amoebae obtained from stools of non-dysenteric patients taken from a medical clinic, a lunatic asylum and various other sources. The research was conducted in the Hygienic Institute of the University of Bonn. 427 such stools were examined by culture on amoeba-agar containing bouillon. The culture dishes were kept in dual sets, one of which was maintained at 22° C., the other at 37° C. They were observed daily for 8 or 10 days, the latter period being desirable as growth of amoebae often occurred on the eighth day.

In about 5 per cent. of more or less normal faeces, amoebae were recovered. They were mostly of the *limax* type, and medium sized forms were most common. Diluted faeces kept at 22° C. gave a greater number of successful cultures than undiluted faeces at the same temperature, and than cultures at 37° C. whether diluted or not. The cultural amoebae were not considered to be in genetic relation to *Entamoeba coli*, being differentiated by the structure of their protoplasm, nucleus and cyst membrane. *Entamoeba coli* cysts were found in some of the faeces examined.

Flagellates of various forms also occurred in the stools. They were usually not free forms but cysts, especially of Lamblia and Trichomonas. The author considers that the flagellates were present originally in the stools and have not arisen from the transformation of amoebae into flagellate forms, as was suggested by WASIELEWSKI.

Amoebae, flagellates and ciliates have also been obtained from food materials, air and dust. A small amoeba has been obtained especially from an infusion of lettuce leaves. Subcultures were successful. Protozoal cultures were also obtained from dust. Some amoebic cysts, from such a source, resisted a temperature of 40° C. for one hour, another set endured an exposure to 50° C. for 1 hour. Flagellates were killed after half-an-hour's exposure to 40° C.

H. B. F.

LAGANE (L.). **Les Protozoaires en Pathologie humaine.**—*Presse Méd.* 1914. Mar. 7. No. 19. pp. 181-185. With 6 text figs.

An interesting review of present day knowledge of the pathogenic protozoa of man. After some general statements the classification, morphology and biology of Entamoebae, Plasmodia and other Sporozoa, Trypanosomidae, Leishmania, Cercomonadidae, Balantidium and Spirochaetes are briefly discussed.

H. B. F.

NOC (F.). **Sur la Durée de Conservation de Protozoaires à l'Etat Humide ou Desséché.**—*Compt. Rend. Soc. Biol.* 1914. Feb. 6. Vol. 76. No. 4. pp. 166-168.

The author has investigated the duration of life of various Protozoa (Infusoria, Flagellates and encysted Amoebae) kept in hermetically sealed flasks. Part of the material consisted of sediment of drinking water of Cochinchina, kept at Paris since 1908 in 20 cc. flasks hermetically sealed. In the humid sediments thus kept for six years, no trace of Infusoria or Flagellates was found, but the amoebic cysts rsisted. The results of five sets were as follows :—

1. Water from wells, Institut Pasteur, Saigon : Some cysts, several plasmolysed.
2. Water from town of Saigon : Cysts absent in deposit.
3. Water from Bassac, Cochinchina : Cysts rare, not plasmolysed.
4. Water from a gully, Cantho : Cysts rare in the deposit.
5. Water from Nui-Ong : No cysts visible.

Cultures made on Musgrave and Clegg's medium yielded some Vahlkampfia, which are common in the water of Cochinchina, thus :—

1. Water from wells, Institut Pasteur, Saigon : Rich culture after 12 days at 25° C.
2. Town water : Amoebae appeared after a month and a-half.
3. Water from Bassac : Amoebae appeared after 10 days.
4. Water from gully : No culture after 1½ months.
5. Water from Nui-Ong : A few amoebae appeared after 12 days.

Thus after six years, moist sediments kept in the dark and without oxygen gave amoebae on culture.

The dry material used for experiment was paper made in Tonkin from native tree bark, and kept dry for 5 years. A culture on agar without peptone yielded a mixed culture of bacteria and a small

flagellate, *Oikomonas termo.* One specimen out of the three preserved gave a culture, while controls were negative. The work sheds an interesting light on the longevity of the Protozoa.

H. B. F.

WOODCOCK (H. M.) & LAPAGE (G.). **On a Remarkable New Type of Protistan Parasite.**—*Quarterly Jl. Microscopical Science.* 1913. Nov. Vol. 59. Pt. 3. pp. 431-457. With 2 plates and 2 text figs.

The authors describe a new parasitic Protist, *Selenomastix ruminantium* (Certes), found in the rumen of Ruminants, especially the goat. (See this *Bulletin*, Vol. 3, p. 121.)

The organism occurs in two chief forms—crescents and ovals. The crescents possess a single large flagellum, arising from about the middle of the concavity of the crescent. Chromatin is present in the form of a peripheral layer. Division is by binary, transverse fission. The ovals bear a general resemblance to the crescents but never possess a flagellum, though capable of movement.

The average sized crescents are $9{\cdot}5\mu$ to 11μ by 2μ to 3μ. The ovals average $7u$ to $9{\cdot}5\mu$ by $3{\cdot}5\mu$ to 5μ. Numerous forms are illustrated.

The authors consider that Selenomastix is an example of a Proflagellate.

H. B. F.

LAVERAN (A.) & FRANCHINI (G.). i. **Infection naturelle du Rat et de la Souris au Moyen de Puces de Rat parasitées par** *Herpetomonas pattoni.*—*Compt. Rend. Acad. Sciences.* 1914. Feb. 16. Vol. 158. No. 7. pp. 450-453.

ii. **Infection de la Souris au Moyen des Flagellés de la Puce du Rat, par le Voie Digestive.**—*Ibid.* Mar. 16. No. 11. pp. 770-772.

i. The object of this paper is to direct attention to the fact that rats and mice can be infected with *Herpetomonas pattoni*, Swingle. This flagellate occurs naturally in the gut of the rat-flea, *Ceratophyllus fasciatus.* The rats and mice used were kept in contact with numerous fleas, so much so that it was necessary to remove them from the vessel every 48 hours and submit them alternatively to 48 hours of bites and 48 hours freedom; otherwise the animals died of profound anaemia. Natural infection with *H. pattoni* was observed in two white rats and two white mice.

The rats were anaemic with hypertrophied spleens. Small leishmaniform parasites occurred in the liver. In one rat, spleen and bone marrow were examined and were not parasitised.

Of the mice, the first had parasites in the liver and spleen and especially in the bone marrow, while flagellated forms occurred in the liver. The second mouse also showed parasites but at the date of writing did not seem ill.

Rats and mice subinoculated intraperitoneally with infected rat's blood and liver emulsion, became infected. The infected rat did not appear to be ill, but a mouse was very ill when killed.

Animals inoculated direct with the flagellates of fleas or with blood or organ emulsion of infected animals show parasites in the blood 3 to 5 days after inoculation. The incubation period is longer when the animals are exposed to the bites of the fleas. The commencement of

infection is marked by the appearance of small parasites, rare or very rare, in the blood. There is need to determine whether infection arises from the bites of the fleas or whether it is produced by way of the digestive tract, by rats and mice eating fleas. Animals exposed continuously to hundreds of flea bites die of anaemia, but the pathogenic action of the flagellates on animals infected by inoculation does not seem doubtful.

Three types of parasites (*H. pattoni*) occur:—(1) Small, oval, leishmaniform bodies, some with a nucleus only, others with nucleus and blepharoplast; (2) Fusiform, nonflagellate forms, 4μ to 5μ long with nucleus and blepharoplast; (3) Oval or spherical bodies, 5μ in diameter, with a free flagellum 10μ to 12μ long, some of which were dividing.

The authors conclude by stating that since their experiments were made under almost natural conditions they have a special interest, and the results obtained are certainly favourable to the opinion of those workers who consider that the trypanosomes of vertebrates and Leishmania have originated from the flagellates of invertebrates.

ii. This interesting paper deals with experimental herpetomoniasis. White mice were used. Some of the rodents were put on a diet and after 24 hours were given a little soaked bread in which numerous drowned rat-fleas (*Ceratophyllus fasciatus*) were placed. The rat-fleas were heavily parasitised with *Herpetomonas pattoni*, about half of the fleas being found to contain flagellates, especially in their hind-guts. The mice ate the bread containing the fleas with avidity. Their blood was examined daily. Details of four such white mice, all of which became infected, are given. For example, one mouse was fed three times, at intervals of 10 days, eating about 150 rat fleas in all. Twenty days after the first feed, small uninucleate intracorpuscular parasites were seen in its blood, and some leishmaniform parasites, but no flagellates. The blood afterwards showed no parasites. Thirty days after the first feed the mouse became ill. It was killed, and its spleen was found to be enlarged. In the spleen and liver uninucleate parasites were seen, both free and intracorpuscular, and a few leishmaniform stages. The remaining three mice became infected, but were found to be well again in four to five weeks after their first infected feed.

The blood of the first mouse, which was killed, was inoculated intraperitoneally into three clean mice. All three became infected in four days, and one died, while one was killed when it became ill. The third one recovered. Leishmaniform parasites were found in the peripheral blood, and in the spleen, liver and bone-marrow after death.

Infection of the mice was by way of the alimentary canal, by swallowing the invertebrate host of the flagellate. The incubation period was 15 to 20 days, much longer than by intraperitoneal inoculation, when the period was only 4 days. The small, uninucleate forms of the parasite were devoid of blepharoplasts. The parasites, after their appearance in the peripheral blood of the host, retreated to the internal organs, especially the spleen and liver.

The authors state that they infected mice by way of the digestive tract with *Crithidia melophagia*, but no details are given.

H. B. F.

WOODCOCK (H. M.). i. **On "*Crithidia*" *fasciculata* in Hibernating Mosquitoes (*Culex pipiens*) and the Question of the Connection of this Parasite with a Trypanosome.**—*Zool. Anzeiger.* 1914. Jan. 20. Vol. 43. No. 8. pp. 370-382. With 41 text figs.

ii. **Further Remarks on the Flagellate Parasites of Culex. Is there a Generic Type, *Crithidia?*—*Ibid.*** Mar. 31. Vol. 44. No. 1. pp. 26-33. With 1 text fig.

i. In the first paper the author gives an account of certain flagellates observed by him in the alimentary tract of hibernating *Culex pipiens.* He considers that "the great majority were undoubtedly the much discussed '*Crithidia*' *fasciculata* of LEGER." The parasites were mostly in the resting stage in the gut, but became active when brought into contact with water. The morphology is discussed and figured. In the flagellate stage no undulating membrane is present, as the author remarks, and the organism has the appearance of a typical Herpetomonas. Non-flagellate forms are also shown. No hereditary infection was found.

ii. In the second paper the author concludes that he is dealing, in *Culex pipiens,* with a leptomonad (or herpetomonad) flagellate, and not with a Crithidia as stated in the first paper. He also acknowledges that there is a genus Crithidia. The article contains much polemical matter.

H. B. F.

KUCZYNSKI (Max H.). **Untersuchungen an Trichomonaden.** [Investigations on the Trichomonads.]—*Arch. f. Protistenkunde.* 1914. Mar. 3. Vol. 33. No. 2. pp. 119-204. With 6 plates and 4 text figs.

The author gives a long and diffuse account of the Trichomonads, basing his remarks largely on his observations of the Trichomonads of mice and guinea-pigs. He discusses the mode of life of the organisms and their distribution within their respective hosts. The various forms of supporting structures are described and the morphology is treated in some detail. The modes of movement and their mechanism receive some attention, but most of the remarks made thereon have appeared in connection with other trichomonads. Amoeboid movements are described and figured. An account of the mode of nutrition is given, the author apparently concluding that they absorb chyme from the gut of their host [which is not surprising]. Division and encystment are described, together with the history of other workers' opinions as to the nature of the same.

[To those who desire to read an abstract of recent German arguments on the Trichomonads this paper will appeal. It does not seem of much interest to tropical workers.]

H. B. F.

VON WASIELEWSKI (Th.). **Zur Kenntnis der Halteridienkrankheit der Vögel.** [On Diseases of Birds due to Halteridia.]—*Trans.* xvii *Intern. Congress of Med.* London, 1913. Sect. xxi. Trop. Med. & Hyg. Pt. 2. pp. 245-249.

The author gives an interesting general account of the blood diseases

of birds due to members of the genus Haemoproteus (often called Halteridium). *H. danilewskyi* is the commonest species and many varieties of it occur in different birds, e.g. *H. danilewskyi columbae* in pigeons, *H. danilewskyi falconis* in kestrels. Multiple infections with various blood parasites are common in these birds, and the pathogenicity of Haemoproteus can only be studied in birds infected exclusively with this parasite. Disease symptoms are rarely well-marked. In the author's experience of over 1,000 birds, only some half a dozen succumbed to Halteridium infection. Two forms of disease occur, one acute which is of very short duration and easily overlooked, the other chronic. Nestlings particularly are affected. *H. danilewskyi falconis*, parasitic in *Falco tinnunculus*, was especially investigated by the author. The earliest forms of the parasite could not be observed, as the nestlings are concealed during the first fortnight of their lives. Flies of the genus Lynchia transmit the parasite. Sexual forms only, and not multiplicative forms, occurred in the circulating blood. Wasielewski considers that the schizogonic stages described by LABBÉ really represent a multiple infection, and he ascribes the misinterpretation by LABBÉ as being due to the technique available at the time of investigation. The paper concludes with a comparison of the structure and biology of a Haemoproteus with that of a human malignant tertian parasite, showing well the many similarities existing between the two organisms.

In a discussion following, GONDER remarked that *Haemoproteus columbae* in South Africa is transmitted by *Olfersia capensis*, a Hippoboscid fly. The infective stage in the fly is the oökinete.

H. B. F.

WOLBACH (S. B.). **Notes on the Life-Cycle of a Hemogregarine found in a Monitor** (*Varanus niloticus*).—*Jl. of Med. Research.* 1914. Jan. Vol. 29. No. 3. pp. 473-488. With 2 plates.

Previously the author has described forms of the haemogregarine from blood films of the monitor killed at Lamin Kota, in the Gambia. A short résumé of this is given, together with an account of the schizogony of the haemogregarine. The blood forms were (a) large, encapsuled forms with a central nucleus $10{\cdot}3\mu$ by $2{\cdot}5\mu$; (b) small forms, 6μ by 3μ, but some intermediate-sized ones occurred. A third distinct type has since been discovered, a short, oval form with "a large amount of nuclear material distributed in belt-like strands," and having extra-nuclear granules. No multiplicative forms have been found in the blood, but various stages in schizogony were found in the heart, lungs, liver, spleen, kidney and in the walls of the stomach and intestine. The multiplicative forms were most abundant in the lungs and liver. Excepting occasional merozoites, young schizonts and vermicular forms which were free in the capillaries, the various stages of the parasite were always within endothelial cells, which usually remained *in situ*.

The forms in the organs are described and their dimensions are given. The two common types of multiplication-cysts are those containing 8 and 64 merozoites. Cysts containing intermediate numbers occur. Other forms of cysts may be found and are described. The schizonts are always oval. A nucleolus may be present. In

schizonts producing about 64 merozoites the nucleoli are not visible, but in schizonts producing but 8 merozoites they persist [nucleolus = karyosome ?]. The macro- and micro-merozoites may represent an early sexual differentiation.

The liver excepted, "the only effect of the presence of the parasite is phagocytosis by individual endothelial cells, so that even microscopical lesions were not produced." The liver has "small tubercle-like areas, composed wholly of endothelial cells, most of which contain the parasite."

The last 6 pages contain a discussion of the results of other workers on the haemogregarines of Varanus, and the author considers the present study gives additional evidence for the classification of haemogregarines of this type among the Coccidia. The name *H. toddii* is proposed, should the parasite prove to be a new species.

H. B. F.

SANGIORGI (G.). *Leucocytogregarina cuniculi*, n. sp.—*Pathologica.* 1914. Jan. 15. Vol. 6. No. 125. pp. 49-50. With 3 text figs.; and *Giorn. d. R. Accad. di Med. di Torino.* 1914. Jan-Feb. Vol. 77. No. 1. pp. 25-29.

The author describes a new species of Leucocytogregarina found in smears of the enlarged spleen of a rabbit examined post mortem. The majority of the forms were elongate, they were concave at one side, possessed rounded extremities and showed a large nucleus which was not always centrally situated. The nucleus contained numerous large chromatin granules. A clear space corresponding to the capsule and very refractile to stains often surrounded the parasites, which averaged $16{\cdot}6\mu$ to $18{\cdot}2\mu$ long and $4{\cdot}1\mu$ to $4{\cdot}9\mu$ broad. Sometimes the organisms were extracellular, sometimes in splenic elements. Smaller forms occurred in large, mononuclear leucocytes. No multiplicative forms were seen. On account of its morphology and biology the author designates it *Leucocytogregarina cuniculi*, n. sp.

The author concludes with a review of the literature relating to the classification of the Haemogregarinidae. He proposes to make two sub-families :—Haemogregarininae for the haemogregarines of the erythrocytes of mammals and Leucocytogregarininae for the Leucocytogregarines parasitic in mammalian leucocytes. A list of the species is given. The paper is illustrated by three text-figures.

Mention is made of three new mammalian leucocytogregarines recently (1913) described from Eritrea and Italian Somaliland by MARTOGLIO, viz. *L. rotundata canis familiaris*, *L. plicata marmotae* and *L. arvalis*.

H. B. F.

CARINI (A.) & MACIEL (J. J.). i. **Infections des Toxoplasmose et de Paralysie bulbaire infectieuse par les Muqueuses saines.**—*Bull. Soc. Path. Exot.* 1914. Feb. Vol. 7. No. 2. pp. 111-114. ii. **Infecção de Toxoplasmose e de Paralysia bulbar infectuosa pelas Mucosas sans.**—*Brazil Medico.* 1914. Feb. 1. Vol. 28. No. 5. p. 41.

These two papers contain the same matter.

In their experiments on toxoplasomosis the authors used strains

obtained from two cases of natural infection with *Toxoplasma canis*. They had already been able to infect pigeons therewith. The toxoplasms can traverse the buccal and gastro-intestinal mucosa of the pigeon. When the healthy buccal mucosa was painted over with an emulsion containing numerous parasites the animal was found to die in 16 days, and many typical toxoplasma were found in its organs.

Also, if a drop of fluid containing parasites was placed on the bird's eye, the pigeon generally died after a time.

H. B. F.

SARRAILHÉ (A.). **Notes sur la Toxoplasmose Expérimentale.**—*Bull. Soc. Path. Exot.* 1914. Mar. Vol. 7. No. 3. pp. 232-240.

The object of the present paper is to give the results of investigations as to the mode of resistance of *Toxoplasma gondii* outside the body of the host. The virus, obtained from the Institut Pasteur, Tunis, was kept in mice. A good series of conclusions is given, of which the most important points seem to be the following :—

(1) *Toxoplasma gondii* is relatively resistant to external influence. Though encysted forms do not occur, it lives and maintains its infectivity as long as 17 days outside the host, at a temperature between 0° C. and 25° C. At 37° C. it rapidly loses its vitality. *T. gondii* can resist putrefactive bacteria and is capable of infecting after being 50 hours in a corpse.

(2) When the virus was warmed to 45° C. for 2 hours, and then inoculated it proved infective but the incubation period was prolonged. Warmed in other cases to 45°, 48·5°, 50°, and 52·5° C. for the same time, the virus lost its infectivity but did not confer immunity on the subinoculated animals.

(3) *T. gondii* resists the action of distilled water for as long as 15 minutes, but not longer.

(4) Various sera, including human, Cynocephalus, rat, had either no, or extremely slight, action on the fresh virus when mixed with it. Sera of animals in course of infection gave no protection to animals inoculated with virus-serum.

(5) Experiments have shown that a virus even at a dilution of 1 per 100,000 is infective to mice by intraperitoneal inoculation.

(6 Though *Toxoplasma gondii* is not common in the circulating blood, peritoneal inoculations of mice with 1, 5 and 15 drops of heart blood from an infected mouse have reproduced the disease.

Tables in illustration of the various results are given, and details of the exhaustive series of experiments are set forth.

[To those interested in the inoculability and extracorporeal life of the parasite, the present paper cannot fail to be of great value and should be consulted in the original.]

H. B. F.

ARANTES (J. B.). **Toxoplasmose. Evolução do *Toxoplasma canis* no Systema Nervoso do Pombo e as Lesões por ella produzidas. (Nota preliminar.)** [Toxoplasmosis. The Evolution of *Toxoplasma canis* in the Nervous System of the Pigeon and the Lesions produced by it. (Preliminary note.)]—*Brazil Medico.* 1914. Apr. 15. Vol. 28. No. 15. p. 144.

A note on the appearance presented by the nervous system of the

pigeon after experimental inoculation with *Toxoplasma canis*. Whilst smears from the liver and the lung gave negative results, those made from brain substance showed a large number of parasites in different stages of evolution. Sections of the brain showed disintegration of the nervous tissue with infiltration by leucocytes, the appearances being similar to those met with in Chagas's disease after rupture of the cyst of the trypanosome. With a higher power it could be seen that many of the leucocytes contained parasites. The phenomena seem to be due to embolism of the arterial capillaries of the brain by parasites, which proceed to form cysts, which afterwards rupture into the nervous tissue.

J. B. Nias.

MIGLIANO (Luiz). **Os Toxoplasmas.**—These apresentada á Faculdade de Medicina do Rio de Janeiro no dia 29 de Setembro de 1913, e defendida no dia 20 de Dezembro de 1913.—76 pp. With 5 figs. 1913. Rio de Janeiro: Typ. de Martins de Araujo & C.

The thesis is divided into two parts, general and special. The first part consists of five chapters dealing with the history, morphology, biology, classification and pathogenicity of Toxoplasma. The second part deals with *Toxoplasma cuniculi*, *T. gondii*, *T. canis*, *T. talpae*, *T. musculi*, *T. columbae* and *T. avium*. There is a bibliography. There are 5 figures, most of them after well-known authors. The work was done in CARINI's laboratory in Sao Paulo and the subject has been summarised from time to time in this Bulletin.

H. B. F.

CASTELLANI (Aldo). **Note on Certain Protozoa-like Bodies in a Case of Protracted Fever with Splenomegaly.**—*Jl. Trop. Med. & Hyg.* 1914. Apr. 15. Vol. 17. No. 8. pp. 113-114. With 2 plates.

PLATE (Ludwig). **Brief Note on** *Toxoplasma pyrogenes*, **Castellani,** 1913.—*Ibid.*, Apr. 1. No. 7. p. 98. With 3 text-figs.

In the first paper Castellani describes certain bodies found in the spleen of a Sinhalese boy suffering from splenomegaly with fever of long standing, who died when aged 14. He had suffered from malaria when 3 years of age. "The fever, while the patient was in hospital, was generally intermittent." "The spleen was much enlarged and hard, the liver slightly enlarged, neither organ was tender on pressure. All other organs were normal."

The bodies were extremely rare in the blood. "They are roundish or pear-shaped, with a maximum diameter of 7 to 12 microns, most of them are vacuolated. The protoplasm by Giemsa stains a pale blue and several large masses of chromatin are present."

Two types of bodies were found in the spleen. "Some, of extreme rarity, are identical to those found in the blood; others, the enormous majority, are different. The latter . . . . are roundish, oval, or crescentic bodies, $2\frac{1}{2}$ to 6 microns in maximum diameter, with protoplasm staining blue, and generally one large roundish mass of chromatin at one pole or in the middle. In one instance the faintest appearance of a flagellum seemed to be present. Occasionally the bodies are larger, roundish or pear-shaped, and have two chromatin

masses, one at each pole or close together. The bodies are generally free; only in one specimen did I find some contained in a leucocyte. Those which have two chromatin masses have quite a different appearance from the Leishman's bodies, being larger and more spherical, and give the impression of being either parasites preparing for division, or fusion forms."

Fig. 1, Body found in the blood. Figs. 2–7, Bodies found in the spleen. [Redrawn from a coloured plate illustrating Dr. Castellani's paper in the *Jl. Trop. Med. & Hyg.* 1914. Apr. 15.]

The magnification is not stated, but Fig. 1 corresponds in size to a red corpuscle shown alongside it in the plate.

In May 1913, Castellani named the bodies *Toxoplasma pyrogenes.* He discusses the nature of the bodies found and has shown them to several medical men and zoologists. In conclusion Castellani writes :— "Personally I am still inclined to consider the bodies found in the spleen to be toxoplasmata, though I quite admit that the appearance of some of them give the impression of their being anaplasmata, or piroplasmata which have infected basophile red cells."

The paper is illustrated by a coloured plate of 25 figures and also by a series of photomicrographs.

In the second article, Professor Plate, of Jena, briefly states the results of his examination of Castellani's preparations. The bodies were quite evident. He is convinced that the bodies "are not degenerated red cells, nor degenerated blood platelets, nor degenerated tissue of any kind." The bodies are "without any doubt of protozoal origin and differ from any other protozoal organism so far described in man; but no conclusion can as yet be come to as regards their being toxoplasmata or not; in fact, no conclusion can be arrived at as regards their exact zoological classification."

H. B. F.

LAVERAN (A.) & MARULLAZ (M.). **Sur la Nature des Corps de Graham-Smith.**—*Bull. Soc. Path. Exot.* 1914. Mar. Vol. 7. No. 3. pp. 240-246. With 1 plate.

The present paper consists of an exhaustive review of the accounts given by various workers of the morphology, staining reactions and probable nature of the bodies first described from the erythrocytes of moles by GRAHAM-SMITH in 1905. Similar bodies have been described since not only from moles but from various mice, rats and gerbils. Many authors appear not to have seen the nuclear structures

shown in the original plate of GRAHAM-SMITH. Some regard the bodies as parasites [*Grahamella talpae*, Brumpt], others as cell enclosures. The present work of Laveran and Marullaz on the bodies in moles was supplemented by examinations of the structures in the blood of rats, mice and gerbils from various sources, the results of which are represented in a plate of 42 figures. Very great variation in size and form are shown. Karyosomatic structures, such as depicted by GRAHAM-SMITH, were never seen. The evidence for or against the true parasitic nature is considered to be still inconclusive. Staining reactions vary, the structures have not been seen in fresh preparations, attempts at inoculation and culture have failed. It is considered probable that the bodies are of the same nature as the basophile granulations common in the erythrocytes of newly born animals and in anaemia. They appear to arise from the disintegration of the erythrocytes that are newly formed.

H. B. F.

GALLI-VALERIO (B.). *Smithia talpae*, **n. sp.** (*Piroplasmidae*) **chez** *Talpa europaea*, **L.**—*Centralbl. f. Bakt.* 1. Abt. Orig. 1914. Feb. 25. Vol. 73. No. 2. pp. 142-143. With 1 text fig.

The author discovered the organism which he names *Smithia talpae* in the blood of two moles sent to him from Malleray, Jura Bernois. The parasites were rare, perhaps, as suggested by the author, because the blood had coagulated and so it was difficult to make preparations. The parasites occurred in erythrocytes and presented two forms :—(1) Single, piriform bodies, almost the diameter of the red corpuscle. They were 3μ to $4{\cdot}5\mu$ long by 1μ to 2μ broad. (2) Round or oval forms, always situated peripherally, and one only in each erythrocyte. Multiplicative forms were not found. The parasite is considered to be a new species of the genus Smithia (whose characteristics are given), and to have no connection with *Grahamella talpae* or *Elleipsisoma thomsoni*.

H. B. F.

DELANOË (M. et Mme. P.). **De la Rareté de** *Pneumocystis carinii* **chez les Cobayes de la Région de Paris. Absence de Kystes chez d'Autres Animaux (Lapin, Grenouille, 3 Anguilles).**—*Bull. Soc. Path. Exot.* 1914. Apr. Vol. 7. No. 4. pp. 271-272.

The authors give an account of a series of observations made by them on the occurrence of pulmonary cysts in guinea-pigs obtained in the neighbourhood of Paris. Of these guinea-pigs two were inoculated with *Trypanosoma pecaudi*, two with *T. rhodesiense* and six with *T. cruzi*. One only showed pulmonary cysts, containing eight vermicules, identical with those described by CARINI from rats infected with *T. lewisi*. This guinea-pig was inoculated with *T. pecaudi* and details are given of the guinea-pig's history. Trypanosomes were numerous in the blood when the host was killed. The authors conclude that *Pneumocystis carinii* (see this *Bulletin*, Vol. i, p. 58) does not represent

a stage of evolution of a trypanosome any more in guinea-pigs than it does in rats. Cysts occurred only in lung smears, not in those of other organs.

No cysts were found in organ smears of a rabbit infected with *T. rhodesiense*, neither did they occur in organ smears of a frog (*Rana esculenta*) infected with haemogregarines, *Bacillus krusei* and *Tryp. rotatorium*. Three eels (*Anguilla vulgaris*) also yielded no cysts. Smears from the gills, however, showed dividing forms of *T. granulosum*. The authors also note that a very sparse infection of a large trypanosome, containing large, bacilliform granulations anteriorly, was present in an eel.

H. B. F.

ACTON (H. W.) & KNOWLES (R.). **The Nature of the Kurloff Body: A Stage in the Development of the Eosinophile Leucocyte.**—*Indian Jl. Med. Research.* 1914. Jan. Vol. 1. No. 3. pp. 523-531. With 1 coloured plate.

Kurloff bodies were found by the authors in birds (e.g. pigeons) as well as in guinea-pigs. They were most common in the bone marrow and liver of pigeons and rare in the peripheral blood. Fairly thick smears were made and fixed in hot sublimate alcohol. The stains used were iron-haematoxylin and Giemsa. The authors extended their researches and carefully studied granule containing leucocytes in birds, reptiles and amphibia.

The following structures are stated to be analogous and to be derived in the same manner from the nucleolar archoplasm :—The archoplasm of the spermatid with its *Initial Körper*, the permanent granules in the leucocytes, and the secretogen granules formed by pancreatic and venomous cells.

The authors' conclusions are as follows :—

1. The Kurloff body is found in the bone marrow of widely different animals, birds, amphibians, and mammals, and is not confined to the guinea-pig. It cannot, therefore, be a parasite.

2. It is a phase in the development of the eosinophile cell and is identical with the structure known as an archoplasmic vesicle.

3. The Kurloff bodies are, therefore, the bone marrow representatives of the granules of the eosinophile leucocytes, and their appearance in the peripheral blood of the guinea-pig or other animal may be associated with helminthic infections.

4. The Kurloff body is formed by the nucleolus in an exactly similar manner to other zymogen granules.

We are, therefore, able to confirm Ehrlich's and Kurloff's view as to the nature of these bodies : they contain *Secretin Stoff*.

5. The eosinophile granules are derived from the nucleolus and are of the nature of zymogen granules.

6. The phases in development seen in these archoplasmic vesicles from the *Initial Körper* to the formation of the spireme stage, coincide exactly with the stages described by E. H. Ross in the development of the *Lymphocytozoon cobayae* : and by Hartmann and Prowazek for Chlamydozoa.

H. B. F.

(1) SCHILLING-Torgau (V.). **Ueber die feinere Morphologie der Kurloff-Körper und ihre Aehnlichkeit mit Chlamydozoen Einschlüssen. II. Mit einem Zusatz über Rosssche Einschlüsse bei Syphilis.** [On the finer Morphology of the Kurloff Bodies, and their Resemblance to Chlamydozoal Inclusions.]—*Centralbl. f. Bakt.* 1. Abt. Orig. 1913. June. 21. Vol. 69. No. 5/6. 412-434. With 2 plates.

(2) SCHILLING-Torgau (V.). **Berichtigung zu Kamil Schulhof: Studien über die Kurloffkörper nebst Beiträgen zur vergleichenden Hämatologie.** [A Correction to K. Schulhof's paper "Studies on the Kurloff Bodies, together with Contributions to Comparative Haematology."]—*Folia Haematologica.* (Archiv.) 1914. Jan. Vol. 17. No. 4. pp. 442-446.

(3) SCHULHOF (K.). **Entgegnung auf V. Schillings "Berichtigung" zu meinen "Studien über Kurloffkörper."** [Reply to V. Schilling's "Corrections" to my "Studies on the Kurloff Bodies."]—*Ibid.* pp. 447-451.

These three papers deal with the highly controversial subject of the Kurloff bodies, found in the blood of guinea-pigs, so often used for laboratory purposes.

(1) The first paper gives a summary of the conflicting opinions of the principal workers with regard to the morphology, nature and significance of the Kurloff bodies, and then the further results of Schilling's observations are detailed. Observations on fresh, unstained Kurloff bodies showed them to possess a refractile, mobile, fluid ground substance, with a denser upper surface, while very fine granules exhibiting molecular motion occurred in the ground substance. Observations on Kurloff bodies stained intra vitam never gave evidence that the whole inclusion, in the sense of PATELLA, was of a parasitic nature, or that there was necessarily a parasitic nature to the ground substance (FLU). No evidence of spirochaetiform parasites nor of free parasitic Lymphocytozoa (ROSS) could be obtained. The effect of staining Kurloff-bodies with Azur II, alone or with other stains, is fully discussed and figured. The identification of the ground substance, Azur-figures, pseudonucleus and intermediate granules is discussed and the conclusion reached is that the Kurloff bodies are cell reaction products formed by a complicated process, and having some resemblance with those resulting from the action of Chlamydozoa. The structural elements are not organisms, but from their morphological characters may be near to the lipoids or of special protoplasmic or archoplasmic structure.

(2) The second paper by Schilling-Torgau consists of a protest against criticisms of his work on the Kurloff bodies made by K. SCHULHOF. A series of quotations from Schilling's work on the subject from 1911 onwards is given to support the statement that his attitude with regard to these structures has been consistent. He has frequently stated his conviction that the Kurloff bodies as entities are most probably cell reaction products of a complicated structure, having some similarity with those produced by the Chlamydozoa.

(3) Schulhof in the third paper replies to the remarks of SCHILLING in (2). He contends that Schilling's corrections—(1) that the Kurloff

bodies are physiological structures, (2) that they are homogeneous and the supra-vital, colourable structures in them only arise from the stains used—are premature.

[We fail to see what useful purpose this controversy serves. It is to be regretted that the energy wasted thereon has not been applied to constructive work. It is a relief and a pleasure to turn from such polemics to a definite constructive memoir like that of ACTON and KNOWLES.]

H. B. F.

SLEEPING SICKNESS.

GERMAN EAST AFRICA. **Sleeping Sickness in German East Africa.**—Report, dated Mar. 10, 1914, from His Britannic Majesty's Vice-Consul at Daressalam, received at the Colonial Office 23 April 1914.

A translation is given of an article on the state of sleeping sickness in German East Africa which appeared in the *Deutsch Ostafrikanische Zeitung*. The data were obtained from Professor KLEINE.

The three principal foci of sleeping sickness in German East Africa are the shores of Tanganyika and Victoria Nyanza, and the Rovuma River. The disease in the last named region is caused by *T. rhodesiense*, whilst that in the other two places is due to *T. gambiense*. An account is given of the measures taken to combat sleeping sickness in the Victoria and Tanganyika districts. They have been followed by complete success in the former region. The principal object of the officials is to prevent the introduction of fresh cases. Two isolation camps have been constructed, in the Shirati and in the Bukoba districts.

The most widespread and most dangerous seat of infection is the Tanganyika coast and it is very important to take steps to control the disease now that the railway has reached the lake. Apart from the actual treatment of sick cases, the principal efforts of the Government are directed towards preventing the introduction of fresh cases and controlling the traffic. In addition to this, efforts are being made to clear the country by destroying the bush. The policy of clearing the people out of an infected area without settling them in a healthy spot, as was done at first, proved unsatisfactory owing to the fact that the infection continues for a considerable period in the fly and in many warm blooded animals. It is now considered that the danger which threatened German East Africa from sleeping sickness in Tanganyika has been averted. Recently there has been a considerable decrease in the number of cases recorded. The difficulty of contending against sleeping sickness is greatly increased by the state of affairs in the Belgian Congo. No natives from German East Africa are allowed to act as porters in the Belgian Congo.

W. Yorke.

D'ALMEIDA (T.). **Sezonismo—Syphilis—Trypanosomiase.** (Excerpto de Lição). [Fever, Syphilis, Trypanosomiasis. (Extract from a Lecture).]—*Medicina Contemporanea.* 1914. Mar. 8. Vol. 32. No. 10. pp. 75-79.

An extract from a clinical lecture on a case of combined malaria, syphilis and trypanosomiasis in a soldier invalided from the Portuguese army on account of these symptoms, containing nothing of special interest. The malaria and syphilis were treated with quinine and intramuscular injections of mercury, and in addition a commencement was made of treatment with salvarsan for the trypanosomiasis. The patient however left hospital, and the ultimate issue of the case is not

stated. The trypanosome infection appears to have been acquired in Angola.

J. B. Nias.

MACFIE (J. W. Scott). **On the Pathogenicity of the Trypanosome (*T. nigeriense*) from a Case of Sleeping Sickness from Eket, Southern Nigeria.**—*Ann. Trop. Med. & Parasit.* 1914. Apr. 21. Vol. 8. No. 1. pp. 29-40.

This paper records the continuation of the author's previous work on the pathogenicity of a human trypanosome from Nigeria (see this *Bulletin*, Vol. 2, p. 344).

All the inoculations, with the exception of two, were subcutaneous and the quantity of infective blood employed was in each case small. In most of the animals which became infected trypanosomes were scanty. Parasites of the small type characteristic of the strain [see previous paper] were seen in all the animals in which the trypanosomes appeared in moderate numbers. Details of the experiments are given in tables. Eight rats (2 black and 6 white) were inoculated; trypanosomes appeared in only one of them, on the 59th day; the animal was alive and well on the 69th day. Three of the rats died on the 7th, 10th and 14th days respectively from intercurrent disease. Seven wild mice were inoculated with 3 positive results. Trypanosomes were found in the blood of these animals on the 5th, 7th and 9th days respectively. The first two died on the 51st and 11th days, but the third was alive and well on the 107th day after inoculation; trypanosomes were always scanty. Twelve experiments were carried out with guinea-pigs; three became infected and nine did not. The disease was very chronic and the animals presented no signs of illness. Of seven dogs inoculated only one became infected, parasites appearing in its blood for the first time on the 85th day. The animal was alive and well on the 115th day after inoculation. Two monkeys became infected on the 11th and 8th days respectively. The disease ran a chronic course and the animals were both alive at the time of writing, 137 and 118 days after inoculation. One of two goats became infected, but trypanosomes were seen in its blood on two occasions (the 63rd and 65th days) only.

The author writes that these experiments indicate the slight degree of pathogenicity of the Nigerian trypanosome. Of the 38 animals inoculated only one had died of trypanosomiasis up to the time of writing. In order to compare the pathogenicity of this strain with that of various strains of *T. gambiense*, the author reproduces the table constructed by YORKE, in which are given the results of inoculations of human trypanosomes obtained by different observers.* The Nigerian trypanosome differs from all the other strains in its slight degree of pathogenicity to rats and dogs. Its virulence is unlike that of any of the strains of *T. gambiense* mentioned in the table, a fact which, in the author's opinion, furnishes additional evidence in favour of the Nigerian strain being a new species of human trypanosome.

W. Y.

* *Ann. Trop. Med. & Parasit.* 1910. Vol. 4. No. 3. p. 367.

TREATMENT.

MOUCHET (R.) & DUBOIS (A.). **Essais thérapeutiques dans la Trypanosomiase humaine.**—*Beihefte z. Arch. f. Schiffs- u. Tropenhygiene.* 1914. Mar. Vol. 18. Beiheft. 3. pp. 5-36. [pp. 85-116.] With a map.

The authors were engaged on sleeping sickness work in the middle Congo district during 1911 and 1912. This district is about 500 km. long and extends along the left bank of the Congo from the Pama in the north to the Inkisi (near Leopoldville) in the south. The population is sparse (76,000 people in an area of about 60,000 sq. km.). In some villages as many as 10–12 per cent. of the population are infected, but on an average the number is only about 4–5 per cent.

In their tours through the district the authors employed salvarsan and arsenophenylglycin for the purpose of treating cases of sleeping sickness, with a view to preventing the spread of the infection. They give the following summary of their results :—

1. Treatments which produce prolonged sterilisation appear to us to play a considerable part in the prophylaxis against trypanosomiasis in this district.
2. Salvarsan and arsenophenylglycin injected in moderate doses produce sterilisation of about 3 months' duration, sometimes much more.
3. Single injections of salvarsan or arsenophenylglycin produce in certain cases apparent cure (*therapia sterilisans magna*).
4. Injections of salvarsan or arsenophenylglycin or of the one and the other repeated at many months' interval give in certain cases, in the first stage of the disease, a good number of apparently definite cures. From this point of view they are the best medicaments to employ prophylactically.
5. With these products as with other drugs one cannot assert that a cure is definite even after several months of observation.
6. Discontinuous treatment is not to be recommended in patients who are in the second stage of the disease.
7. Arsenophenylglycin given in repeated small doses has not exhibited any particular toxic action, nor however has it produced any notable curative effect, on patients in the second stage of the disease.
8. Atoxyl administered in massive doses in association with potassium emetic often produces fairly long sterilisation.
9. Orpiment has little action in moderate doses and is dangerous in large doses—it is impossible to entrust it to persons unaccustomed to the drug.

The routine method of treatment adopted for the most part by the authors was atoxyl and potassium emetic. Atoxyl was given on Monday in doses of ·5 to 1 gm. and the emetic on Thursday in doses of ·1 gm. Such treatment was continued for 4 to 6 months. The total amount of atoxyl which the patients received was 10 to 20 gm. and of emetic 1·75 to 2·5 gm. In all, 97 patients were treated regularly in this manner; of 28 in the first stage of the disease, who were under observation for a sufficient period, 5 were worse and 23 apparently cured, 12 of the latter being free from trypanosomes for more than a year. The results are the more favourable when it is remarked that of the five who were not benefited three were bordering on the second stage of the disease and one had relapsed after a previous treatment. In the second stage of the disease it is necessary to treat uninterruptedly for a long period. When the general condition is good and the lymphocytosis in the cerebrospinal fluid only slight, a certain amount of success and even some definite cures have been obtained.

Atoxyl alone, 1 gm. per week in robust patients in the first stage and ·5 gm. in those in the second stage, has been administered in many instances. Tolerance to such doses is very marked. Several patients have borne 25 to 30 gm. of atoxyl but there were some accidents to deplore. There were 5 cases of ocular trouble and 2 of locomotive disturbance. Three of these, occurring in patients still in the first stage, were certainly of arsenical origin. Amongst patients in the first stage so treated there were several apparently definitely cured; the results obtained with those in the second stage were inferior to those obtained by combined treatment of atoxyl and emetic.

Arsacetin was employed in 40 cases, who were either in the second stage or had not been benefited by other treatment. Three or four injections of 1 gm. were given at weekly intervals and then ·5 gm. The injections were well borne. The results were similar to those obtained with atoxyl.

Soamin was given to 21 cases mostly in the second stage. Of the 13 cases in the second stage who received 20 to 30 injections of ·5 to 1 gm., 3 are dead, 4 are worse, 2 have disappeared and 4 have benefited. It is too soon to write of those treated in the first stage of the disease.

Experiments were also conducted with "emetique d'Yvon" which contains both arsenic and antimony. It is given intravenously and stands boiling. It is tolerated in fairly large doses and up to ·2 gm. was given. In many individuals doses larger than ·15 gm. produced syncope, nausea and vomiting. The drug appeared to cure a number of persons in the first stage, but in the second stage it only produces more or less transient amelioration. A few cases were treated with tryparosan with unsatisfactory results; the drug was given by the mouth. Similarly unfavourable results were obtained with trypasafrol in the few cases to which it was given.

W. Y.

HALBERSTAEDTER. (L.). **Zur Chemotherapie der experimentellen Trypanosomeninfektion.** (Berlin. mikrobiologische Gesellschaft. 1913. 6th Feb.) [On the Chemotherapy of Experimental Trypanosomiasis.]—*Berlin. klin. Wochenschr.* 1913. Vol. 50. No. 9. p. 418.

The author refers briefly to the results obtained by various workers with mercury, both alone and in combination with other drugs, in trypanosomiasis. When he had convinced himself that mercury compounds themselves had no action on the course of nagana infection in mice, he decided to combine them with trypanocidal remedies. He used at first aethylhydrocuprein. This preparation was administered alone in such doses that it produced at no time a certain influence on the trypanosome infection. On the contrary when mercury was injected at the same time, the trypanosomes were cleared from the blood. Many different preparations of mercury were used with equal success, but it was invariably found that very large doses were necessary—doses which were toxic or even lethal. Moreover the trypanosomes were only affected when the infection had not progressed far; they disappeared transiently from the blood and in all cases relapses occurred; and frequently the treatment exerted no definite influence on the infection. Sub-

sequently, mercury preparations were combined with arsacetin and results obtained somewhat similar to those with aethylhydrocuprein.

Excellent results were obtained, however, by combining mercury preparations with salvarsan. The quantity of salvarsan used was $\frac{1}{2}$ to $\frac{1}{4}$ of the really active dose. Single administrations of relatively small doses of mercury were sufficient to drive the trypanosomes out of the blood in infections already far advanced. Mercury salicylate was mostly used. By employing large, almost toxic, doses of this remedy in combination with salvarsan definite sterilisation was produced even in heavy infections. Small doses of mercury salicylate caused merely temporary disappearance of the parasites from the blood. Similar results were obtained with sublimate and mercuric iodide.

It appears that the combination of mercury with salvarsan is far better than that of mercury with other preparations.

W. Y.

DANYSZ (J.). **Essais de Chimiothérapie. Combinaisons des Sels d'Argent et des Composés Arsenicaux dans le Traitement des Trypanosomiases Expérimentales et de la Syphilis chez l'Homme.** — *Ann. Inst. Pasteur.* 1914. Mar. Vol. 28. No. 3. pp. 238-256.

A study of the antiseptic properties of the different metallic salts and of the action of these salts on normal blood and on specific sera led the author to conclude that of all these products the silver salts possess the greatest microbicidal power in relation to their toxicity and that they modify the antitoxic and antimicrobic properties of normal or immune sera least.

He then studied the therapeutic value of salts of silver, notably the azotate, but quickly found that in the pure state silver salts exerted little action. Very dilute solutions (1 in 80,000 to 1 in 100,000) had no effect on microbic infections, whilst introduction of stronger solutions was followed by damage to the veins and tissues. It was therefore decided to combine silver with other substances possessing special affinities for certain micro-organisms. Silver was first combined with the aniline dyes and subsequently many other combinations were used, but the combination of silver salts and dioxydiamidoarsenobenzol gave results superior to all others.

The author used compounds composed of the chloride, bromide or iodide of silver and of dioxydiamidoarsenobenzol. A brief description of the preparation of these products is given. He has tested the therapeutic value of the compounds on animals infected with trypanosomes (*T. evansi*, *T. rhodesiense* and *T. dimorphon*) and spirochaetes (*S. gallinarum*, *S. duttoni*, syphilis in man and experimental syphilis in the rabbit). The author designates dioxydiaminoarsenobenzol chloroargentique "ACA," the bromine compound "ABA," and the iodine compound "AIA." The proportion of chloride, bromide or iodide of silver in combination is indicated by a figure; thus a combination of one molecule of chloride of silver with three molecules of dioxydiaminoarsenobenzol is designated "ACA^3."

The toxicity of the three products is almost the same. Rabbits of 2·7 to 3 kilo. tolerate an intravenous injection of ·2 gm. dissolved in 20 cc. of water. Guinea-pigs of 350 to 500 gm. tolerate intra-

muscularly 3 cgm. dissolved in 3 cc. of water, and mice of 16 to 22 gm. stand a subcutaneous injection of 2·5 mgm. dissolved in 1 cc. of water. An injection of 11 cgm. per kilo. killed one of three rabbits, 10 cgm. per kilo. killed two of four guinea-pigs and 3 mgm. killed one of three mice weighing 20 gm. The toxic dose is therefore 10 cgm. per kilo., whilst the largest dose tolerated is 7 to 8 cgm. per kilo.

In his therapeutic experiments the author used chiefly mice infected with *T. evansi.* The bromine compound (ABA^3) was found to be much more active than the other two; ·07 mgm. given at a single injection 60 hours after inoculation cured mice. The dose tolerated is 2·5 mgm. and hence the toxic dose is to the curative dose as 36 is to 1. The product is 3 times more active than salvarsan and 35 times more active than atoxyl.

As a result of further work with this product (ABA^3), it was determined that cures were obtained more certainly and with smaller doses when treatment was commenced soon after infection; and that frequently repeated injections of small doses give better results than the same quantity given at a single dose. Where one cannot with absolute certainty obtain a definite cure by a single injection, several doses spaced at sufficiently short intervals of time are indicated. If the first injection causes the parasites to disappear from the circulating blood for some days, the second should be given before their reappearance, and a third will have still better effect.

Other experiments showed that the compound ABA^3 was almost as active in the case of infections due to *T. rhodesiense* and *T. gambiense* as in those due to *T. evansi.* Mice infected with *T. rhodesiense* were cured by a single injection of ·1 mgm. of ABA^3 alone and of ·04 mgm. when combined with trypanred. On the other hand doses of 1 and even 2 mgm. of ABA^3 only delayed death for some days in the case of mice infected with *T. dimorphon.*

In spirillosis of fowls the product ACA^4 proved to be much more active than salvarsan. Details are given of the treatment of a number of cases of human syphilis with ABA^3.

W. Y.

YORKE (Warrington) & BLACKLOCK (B.). **Antimony Trioxide in the Treatment of Experimental Trypanosomiasis.**—*Ann. Trop. Med. & Parasit.* 1914. Apr. 21. Vol. 8. No. 1. pp. 55-72.

The authors experimented with antimony trioxide or "Trixidin," controlling and extending some of the work of KOLLE, HARTOCH, ROTHERMUNDT and SCHUERMANN (1913) on the use of this drug in trypanosomiasis.

"The drug was administered intramuscularly as a rule, but intraperitoneal and intravenous injections were also used in some cases. For the intramuscular injections 10 per cent. and 40 per cent. suspensions of the drug in oil were prepared; for the intraperitoneal injections 1 per cent. suspension in 0·9 per cent. sodium chloride solution was used. As the latter suspension quickly deposited, it was found unsuitable for intravenous injection. In order to overcome as far as possible this difficulty, the drug was reduced by special means to an exceedingly fine powder which was suspended in distilled water. The suspension was allowed to stand in a cylinder for 18 hours, after which time the upper portion was decanted off. The amount of antimony trioxide contained in these suspensions was found to vary from 0·13 to 0·35 per cent.

"The intramuscular method of administration possessed distinct advantages over the others, and was followed by much more beneficial results."

Various strains of trypanosomes were used in the experiments The results obtained are summarised thus by the authors :—

"1. As regards the amount of antimony trioxide which can be given at a single dose without causing toxic effects, either local or general, it was found that, as is generally the case, a relatively much larger quantity is borne by small than by large animals. At least 1 mg. per 10 grms. of body weight can be administered intramuscularly, or intraperitoneally to rabbits guinea-pigs, rats and mice without any untoward result. In donkeys and dogs, on the other hand, such a dose frequently caused death, and even much smaller doses were followed by abscesses at the site of inoculation."

"2. Although the amount of drug administered can be regulated, we have, unfortunately, no control over the amount or rate of absorption. Post-mortem evidence proves that the proportion absorbed during a period of six months is exceedingly small. Probably this factor explains the somewhat unsatisfactory and contradictory results obtained."

"3. In view of the extremely long periods after which relapses have occurred, we must be very cautious in stating that an animal is cured. But as several have remained negative without relapse for over 200 days, and subinoculated animals have not become infected, it appears that a certain number of cures have resulted."

"4. Most of the strains used by us, viz., *T. rhodesiense, T. brucei, T. ugandae, T. evansi, T. equiperdum, T. congolense,* and *T. equinum,* appear to be very susceptible to the drug and trypanosomes disappear from the blood of infected animals within a couple of days of treatment. Our laboratory strains of *T. gambiense* and *T. lewisi* proved to be refractory."

"5. Relapses after the blood had been negative for at least 100 days occurred in animals infected with *T. rhodesiense, T. ugandae, T. vivax* and *T. equiperdum.*"

"6. The drug exerted a definite prophylactic action when injected into guinea-pigs against subsequent infection with *T. rhodesiense,* but none against our laboratory strain of *T. gambiense.* No prophylactic effect was noticed in goats against *T. vivax* nor in donkeys against *T. rhodesiense.*"

H. B. Fantham.

COHN (Julie). **Chemotherapeutische Untersuchungen über die Wirkung von China-Alkaloiden.** [Chemotherapeutic Studies on the Action of the Quinine Alkaloids.]—*Zeitschr. f. Immunitätsforsch. u. Experim. Therapie.* 1913. Vol. 18. July 17. No. 5. pp. 570-590. With 14 text figs.

This paper is a report on the therapeutic action of certain quinine alkaloids in experimental trypanosomiasis. The following conclusions are reached :—

1. If in the treatment of nagana infections one substitutes for quinine the stereoisomeric compound quinidin, no essential reduction in efficacy is noticeable.
2. If the secondary alcohol group of the quinine alkaloid be destroyed, chlorine being substituted for the hydroxyl group, or if the secondary alcohol group is oxidised to ketone, the trypanocidal action of the quinine alkaloid is to some extent diminished but is not however completely lost.
3. If the nitrogen-carbon combination in the loipon portion of the quinine alkaloid be broken up the trypanocidal action is increased ; at the same time, however, the toxicity of the preparation is increased.

W. Y.

YORKE (Warrington) & BLACKLOCK (B.). **Observations on a So-called Cure for Trypanosomiasis.**—*Ann. Trop. Med. & Parasit.* 1914. Apr. 21. Vol. 8. No. 1. pp. 51-53.

The material tried was serum prepared by Mr. H. C. SIEG, who had approached the British South Africa Company with a view to its purchase. The sera were stated to contain no chemical or mineral poisons. "Injection was to be made subcutaneously, and the dose recommended was 1 cc. for small animals, to be repeated if necessary." Twenty-nine animals were treated, including rats, guinea-pigs and rabbits infected with various strains of pathogenic trypanosomes (e.g. *T. rhodesiense*, *T. gambiense*, *T. brucei*, *T. ugandae*, *T. evansi*). "In no case did recovery take place nor, in fact, was the course of the disease influenced in the slightest degree."

The authors conclude that "The 'sera' supplied . . . . had not the slightest therapeutic value in animals experimentally infected with pathogenic trypanosomes."*

H. B. F.

T. CRUZI INFECTION.

CARINI (A.) & MACIEL (J.). i. **Existence de la Maladie de Chagas dans l'Etat de Sâo Paulo.**—*Bull. Soc. Path. Exot.* 1914. Apr. Vol. 7. No. 4. pp. 289-292.

ii. **Distribution des Triatomes dans l'Etat de Sâo Paulo.**—*Ibid.* pp. 292-295.

i. The authors have searched for the presence of *T. cruzi* in Sâo Paulo, Brazil. They obtained triatomes—larvae, nymphs and adults—from various districts in the State. On arrival at the laboratory the insects were examined for the presence of flagellates, and in the hind gut of those coming from certain districts were found crithidiae and trypanosomes, presenting the same characters as the developmental stages of *T. cruzi*. In order to make certain that the flagellates in question were really *T. cruzi*, laboratory animals were inoculated with the gut contents of the bugs: in the blood of certain of these *T. cruzi* subsequently appeared. The bugs examined and found infected were *T. infestans*, *T. megista* and *T. sordida*.

As a result of this discovery it was decided to examine human beings for cases of infection. The diagnosis is not easy, as trypanosomes are rarely found in the peripheral blood; it is as a rule necessary to inoculate susceptible animals with blood of suspected cases. In the absence of other animals the authors used guinea-pigs, which generally die some time after the inoculation without trypanosomes having appeared in their blood. It is necessary to examine sections of muscle to demonstrate the multiplication forms of the parasite. Amongst the numerous guinea-pigs inoculated from clinically suspicious cases multiplication forms of *T. cruzi* were found in sections of muscle from one. This guinea-pig had been inoculated from a 10 year old child which had lived in a hut badly infested with *T. infestans*. The child was very anaemic and had enlarged lymphatic glands. The guinea-pig died 35 days after inoculation.

* This preparation would appear to be the same as that tested, with similar results, by GROSSULE (see this *Bulletin*, Vol. 3, p. 168).—ED.

ii. The authors have made careful enquiries regarding the distribution of *Triatoma* in São Paulo, and from the information obtained have constructed a map indicating the places where the bugs are known. The State can roughly be divided into two zones, viz.—that infested by Triatoma and that free from the bugs. The non-infested zone, forming about a third of the State, consists of a rather large tract of country along the coast. The infested zone is situated in the north east. The population is mostly engaged in the cultivation of coffee and sugar cane. The bugs are usually found in the huts occupied by the poor field workers ; the insects obtain suitable shelter in the holes in the walls and straw roofs. Even the better class houses are not entirely free. Whether the Triatoma have existed in the State for a long period and are now disappearing before the advance of civilisation or whether they are of recent importation into the country is a question not without interest. Many trustworthy persons state that it is only during recent years that the bugs have made their appearance on the fazendas. Possibly they have been introduced by immigrants or nomads from neighbouring infested districts. The species found most frequently was *T. infestans*, then *T. megista* and finally *T. sordida*. All three species were found to be infected with *T. cruzi*.

W. Y.

Blacklock (B.). **On the Multiplication and Infectivity of *T. cruzi* in *Cimex lectularius*.**—*Brit. Med. Jl.* 1914. Apr. 25. pp. 912-913.

This paper deals with attempts to transmit *T. cruzi* from infected laboratory animals to healthy animals by means of the common bed bug. The experiments were done at Runcorn with bugs collected from infested houses. Before commencing the experiments 216 of the bugs were examined for flagellates ; the result was negative. Mice were used in the first attempts at transmission, but proved unsatisfactory as they very frequently died before the disease had time to develop. Guinea-pigs were then used and gave better results, as they lived for long periods even when the bugs were fed on them frequently. Infected bugs were fed on 28 animals. The number of days elapsing between the infective meal of the bugs and the time they were placed on the healthy animal varied from 2 to 114 days. Faeces were passed freely by the bugs on the shaved skin of the experimental animal in most cases. Only one animal—a guinea-pig—became infected.

That the bugs contained parasites capable of causing infection when inoculated into animals is shown by many observations and experiments. The author found in the alimentary canal of bugs fed on animals infected with *T. cruzi* a very constant appearance of flagellates ; a large crithidial form predominated, but varieties resembling blood forms were seen in the rectum of several bugs and intermediate forms were found in large numbers. Of 32 animals inoculated with the alimentary contents of bugs containing flagellates, 9 developed the disease. In 7 mice so infected the average incubation period was 22 days and in 2 guinea-pigs 25 days. Successful results were obtained with animals inoculated with the alimentary canal

contents of bugs which had fed on infected animals so recently as twenty-one hours, and so long as seventy-seven days previously.

The conclusions are :

" 1. *T. cruzi* is capable of living and multiplying in *Cimex lectularius* for long periods.

" 2. The parasites found in the bed-bug are infective on inoculation as early as twenty-one hours and as late as seventy-seven days from the infecting feed.

" 3. It is not possible to say which of the many different forms occurring in the bug causes infection in the vertebrate host.

" 4. Transmission of the disease to healthy animals by feeding infected bugs on them is of very rare occurrence. It was only once observed in the course of these experiments.

" 5. There is no evidence of hereditary transmission of *T. cruzi* in *Cimex lectularius.*"

[This paper should be compared with that of BRUMPT (see *Sleeping Sickness Bulletin*, Vol. iv, p. 286).]

W. Y.

SERUM DIAGNOSIS OF DOURINE.

WATSON (E. A.). i. **The Serum Reactions and Serum Diagnosis of Dourine.**—*Dept. of Agriculture, Canada. Report of the Veterinary Director General* (F. Torrance, B.A., D.V.S.) *for the Year ending 31st Mar. 1913.* pp. 102-107. Ottawa : Printed by C. H. Parmalee.

ii. **Report on Dourine.**—*Ibid.* pp. 81-86.

i. The author considers the following serum reactions to be of unquestionable value in the diagnosis of dourine :—

1. The complement fixation test.
2. An agglutination test.
3. A precipitation test.
4. The acetic acid test.

The complement fixation test.—To obtain antigen the blood of 5 to 10 or more rats is collected at the height of the infection. The trypanosomes are separated by centrifugation and are washed with normal salt solution. After washing, the trypanosome deposit is added to salt solution in the proportion of 1 to 10 and shaken with glass pearls for two or three days ; the emulsion is then filtered through a Berkefeld filter, the filtrate constituting the antigen. The other reagents for the test are prepared in the ordinary manner.

The agglutination test.—This is much simpler than the previous test requiring, in addition to the serum to be tested, only one reagent—the antigen. This is prepared as described above, but instead of the filtrate the homogeneous emulsion of trypanosomes is used. If there is any spontaneous or auto-agglutination of the trypanosomes in the salt solution, resulting possibly from withdrawing the blood from the rats at too late a stage of the infection, the emulsion should be discarded as useless. It is possible to keep the antigen for a considerable time by storing in ice or by the addition of a small quantity of formaldehyde ; but it is advisable, whenever possible, to use a fresh emulsion. Unless the trypanosome emulsion has just been previously prepared it should be centrifuged, fresh salt solution substituted and the mixture thoroughly shaken to obtain the required homogeneous consistency. About two drops of the emulsion is added to each of a series of 12 tubes,

the first of which contains salt solution and the others dilutions of the serum to be tested varying from 1 in 20 to 1 in 10,000. After shaking the tubes are placed in the thermostat for 1 to 2 hours at 37° C. and the reactions noted at half hour intervals. The reaction may be taken as positive when agglutination occurs in dilutions of 1 in 1,000. Normal and non-specific sera will agglutinate not at all or only in the lesser dilutions of 1 to 20 or 1 to 50, or rarely 1 to 100, whilst dourine sera will agglutinate the trypanosomes in dilutions up to 1 in 4,000 and even 1 in 10,000.

The precipitation test.—Only two reagents are required—serum and antigen. The antigen consists of an absolutely clear extract of try panosomes filtered through a fine Berkefeld filter. To each of a series of tubes ·5 cc. of antigen solution is added and then an equal amount of the different sera to be tested—specific, normal and the unknown or suspected sera. The serum is added to each tube by means of a fine capillary pipette the point of which is passed through the antigen fluid to rest upon the bottom of the tube and the serum then slowly discharged so as to push up the antigen fluid without mixing with it. If the serum contains antibody, a thin white ring will appear at the point of junction of serum and antigen in from 10 to 15 minutes or earlier. The test is still more delicate if three tubes be taken for each serum, to which are added ·5 cc. undiluted serum, ·5 cc. of serum diluted 1 in 5 and ·5 cc. of serum diluted 1 in 10 respectively. In such dilutions the white ring is never shown by any but dourine sera and the reaction is quite specific. Both antigen and serum must be fresh.

The acetic acid test.—This is a purely chemical and quantitative test for the determination of an increased globulin content of blood serum. It is a modification of the test for syphilis devised by Noguchi, who demonstrated in this condition an increase of the globulin content of the blood serum and cerebrospinal fluid; butyric acid was used as a precipitant for globulin. To centrifugal tubes graduated to 10 cc., 1 cc. of serum and 9 cc. of a half saturated solution of ammonium sulphate are added; the tubes are then shaken, allowed to stand for 1 hour and then centrifuged until the globulin is precipitated as a firm mass. The supernatant fluid is then removed and the precipitate dissolved by adding sufficient salt solution to make up to the original volume of 10 cc. In making the test the following quantities of globulin solution are placed in each of 5 small test tubes viz., 1·75 cc., 1·5 cc., 1·25 cc., 1 cc. and 0·75 cc. The volume in each tube is then made up to 2 cc. by the addition of salt solution and finally 1 cc. of 10 per cent. of acetic acid added to each. After shaking the tubes are placed in the incubator at 37°–39° C. for 2 to 3 hours. Dourine sera in a few hours give a very marked cloudiness, which gradually becomes opaque, turbid, flocculent and finally precipitates after 24 hours leaving a clear supernatant fluid. Normal sera give at the most a slight opalescence in Tube 1 and possibly a very faint bluish tinge in Tube 2. The intensity of the reaction is in direct proportion to the amount of globulin present. This is not an absolutely specific test for dourine any more than the butyric acid test is for syphilis. Watson has applied the test in cases of coital exanthema, glanders, influenza, fistulous withers and in a single case of swamp fever; only in the last was a positive reaction obtained. Perhaps the greatest value of the acetic acid test is as a negative reaction excluding dourine infection.

When the acetic acid test is positive, diagnosis should be controlled by one of the other tests.

In conclusion the author writes that the serum reactions of dourine have now become an important factor in the diagnosis and control of the disease in Western Canada and the outlook for stamping out infection is much more promising than it has ever been before. [This paper should be compared with that of MOHLER, EICHHORN and BUCK (see this *Bulletin*, Vol. 3, p. 424).]

ii. The author investigated an outbreak of dourine at Unity, Saskatchewan, which proved to be an unusual type of the disease and is of especial interest as being the first outbreak of dourine in Canada to be investigated by the serological methods of diagnosis. A symptomatic diagnosis was made in January 1912. The infections were mild and easily tolerated, for veterinary inspectors called in a few weeks later were unable to agree on the diagnosis. When the author saw the animals two months later no appreciable advance in the course of the disease was noted. He observed some oedematous infiltrations of the tissues and a suspicious condition of the stallion concerned, but still he was unable to arrive at any definite conclusion as to diagnosis. A search for trypanosomes was negative. Blood was drawn from the stallion and from one of the mares and serological tests undertaken. The serum in each case gave a positive dourine reaction, agglutinating dourine trypanosomes in serum dilutions down to 1 in 2,000, showing also an increased serum-globulin content by the precipitation reaction with the acetic acid test. [For description of these tests see previous paper.] Later the blood of other suspected mares was similarly examined with positive results. Some of the animals died of dourine and the trypanosomes were found in one mare. The earlier symptomatic diagnosis of the disease was therefore supported by serum diagnosis. Detailed directions for taking blood for serum diagnosis are given.

Watson refers to some interesting observations on the transmission of dourine to laboratory animals and on the exalted virulence of the trypanosomes for equines which resulted. During the years 1906 to 1912 many attempts were made to inject laboratory animals (dogs, rabbits, wild mice and gophers). Seventy-seven of the animals were inoculated from infected horses without success. Over 50 white rats were then inoculated with a strain of *T. equiperdum* which after passage through a series of 10 young foals showed a very high degree of virulence for horses, but with scarcely any success for, although several rats were apparently carriers, the blood of one proving infective for a horse, the author was unable to carry on the strain in rats by subinoculation. In November 1912 Watson succeeded in infecting white mice from a mare and after the first passage was made there was not the slightest difficulty in carrying on the strain, which became so virulent that it killed rats in less than three days and mice in 48 hours. Guinea-pigs and rabbits were also successfully inoculated, the former dying in three weeks and the latter in six. Horses inoculated with this strain after it had passed through the rats developed an acute infection, and two dogs which licked the carcass of one of the horses became infected and died in six weeks.

W. Y.

OEHLER (R.). **Untersuchungen über den Dimorphismus von** *Trypanosoma brucei.* [Investigations on the Dimorphism of *T. brucei.*]—*Zeitschr. f. Hyg.u. Infektionskr.* 1914. Apr. 4. Vol. 77. No. 2. pp. 356-370. With 8 text figs.

The author refers to his previous work, in which he showed that by the method of single trypanosome isolation and inoculation it was possible to separate from a double infection two pure trypanosome strains (see this *Bulletin*, Vol. 1, p. 525 and Vol. 2, p. 359). The experiments described in the present paper were done with a strain of *T. brucei* (St. 63) obtained from a naturally infected ox and brought to Europe from East Africa by BRAUN and TEICHMANN (this *Bulletin*, Vol. 3, p. 421). This strain presents a well marked polymorphism, long slender free flagellar forms, short broad aflagellar and intermediate varieties being found. In certain of the short aflagellar forms the nucleus was situated posteriorly.

The author made 40 single trypanosome inoculations from an infected guinea-pig into white mice and on two occasions infection resulted. The incubation period was in each instance 6 days, as compared with the 4 to 6 days after the usual method of inoculation of many parasites. The proportion of successful inoculations (5 per cent.) was very small as compared with that obtained in previous work of the author with the very virulent strain of Togoland nagana (St. 4). In this case 20 per cent. of the single trypanosome inoculations were successful. The author considers this difference to be due to the high degree of virulence of the latter strain as compared with that of the former. Both infections obtained as a result of inoculation of single trypanosomes were exactly as polymorphic as the original strain, and the polymorphism was observed from the first day of the infection. Oehler points out that this result differs somewhat from that obtained by von PROWAZEK with *T. rhodesiense.* Von PROWAZEK found that only the slender forms appeared at first and that the dimorphism was not to be noticed until the third or fourth passage (see this *Bulletin*, Vol. 2, p. 39). It is concluded that the dimorphism of *T. brucei* is not the result of a double infection and, further, that it has nothing to do with a sexual differentiation.

Experiments are described which show that not only passage through different kinds of animal host but also passage through animals of the same kind will lead to the purification of a mixed infection. A salvarsan resistant race and a normal race of nagana (St. 4) were mixed and inoculated from mouse to mouse. The two components of this mixed infection could readily be recognised *in vitro* by adding to the blood of the mouse a solution of salvarsan; the normal race of trypanosomes was at once immobilised by the drug, whilst the resistant race continued actively mobile. After many passages through mice the salvarsan resistant trypanosomes became fewer and fewer, until by this test only susceptible trypanosomes could be found. The test is however coarse, as it fails to recognise a slight admixture of the resistant race. The presence of such a race is, however, at once demonstrated by treating the mouse with 1 mgm. of salvarsan. The trypanosomes disappear from its blood for a day but soon return. The test *in vitro* now shows all forms to be resistant—the preponderating susceptible race had been destroyed by the drug. After still

further passages, however, the resistant race disappears and only susceptible trypanosomes are found. In order to reduce a mixed infection consisting of a minimum content of susceptible trypanosomes and a maximum content of resistant trypanosomes to an infection containing the two races in equal amounts, about 10 passages were required; about 40 passages were found necessary to cause the disappearance of the salvarsan resistant trypanosomes as demonstrated by the *in vitro* reaction, and about 55 passages to produce complete disappearance of the resistant race as demonstrated by the reaction *in vivo*.

The author considers the question whether the dimorphism of *T. brucei* has anything to do with sexual differentiation. The broad forms have been held to be female and the slender forms male varieties. As both forms occur regularly in the infections resulting from single trypanosome inoculations, this explanation of dimorphism cannot be correct. Oehler considers that the slender forms are growth forms (*Wucherungsform*) and the broad forms "Remission" forms. He points out that the expression dimorphism refers really to the extreme types of trypanosome met with in such species as *T. brucei*, *T. gambiense* and *T. rhodesiense*, but that in addition all stages of intermediate forms are met with.

Regarding the change of forms met with in the course of infection in mice with the dimorphic nagana strain, the author states that the broad forms herald a remission. The first trypanosomes which appear after the remission are similar to those which first appear after inoculation—"broad intermediate" varieties or the "moderately broad" forms; then the trypanosomes become more numerous and more slender until at the height of the exacerbation the slender forms vastly preponderate.

The broad varieties are hence remission forms and the slender varieties exacerbation forms.

W. Y.

DELANOË (P.). **Des Variations du Pouvoir Infectieux et de la Virulence de *Trypan. dimorphon* L. et M. (Deuxième Note.)**- *Bull. Soc. Path. Exot.* 1914. Apr. Vol. 7. No. 4. pp. 281-289. With 1 text fig.

This paper describes the manner in which a strain of *T. dimorphon*, which at the time of its isolation from a naturally infected ox was absolutely non-inoculable into the white rat and guinea-pig, has been made virulent for these animals. This paper is a continuation of previous work on this subject by the author (see this *Bulletin*, Vol 3, p. 253).

The various subinoculations made are described in detail and are summarised in a table at the end of the paper. From the naturally infected ox a white rat and a kid were inoculated; the kid became infected with a double infection of *T. dimorphon* and *T. cazalboui*—the rat remained healthy. From the kid a series of animals (3 white rats, 4 grey rats, 1 guinea-pig, 1 rabbit, 1 *Golunda campanae*, 2 *Xerus erythropus* (squirrel), a pig and 2 dogs) were inoculated with only one positive result: one of the dogs developed a slight infection of *T. dimorphon*. From this dog three rats and a goat were inoculated, and all but one rat became infected. The strain was carried on in

guinea-pigs and rats by subinoculation from the goat and from one of the rats and the subinoculations were successful.

The conclusion is that it is sometimes difficult to demonstrate the susceptibility of the white rat and guinea-pig to *T. dimorphon* and that it must only be concluded that a trypanosome is not pathogenic for a species of animal after repeated and sufficient trial. [This conclusion is similar to that reached by BLACKLOCK and YORKE (see this *Bulletin*, Vol. 3, p. 169).]

W. Y.

HAGEMEISTER (Wolfgang). **Ueber die Züchtung pathogener Trypanosomen auf künstlichen Nährböden.** [On the Cultivation of Pathogenic Trypanosomes in Artificial Media.]—*Zeitschr. f. Hyg. u. Infektionskr.* 1914. Apr. 1. Vol. 77. No. 2. pp. 227-256.

A brief summary is given of the literature dealing with attempts to cultivate pathogenic and non-pathogenic trypanosomes in artificial media.

In his later experiments Hagemeister used the Novy-MacNeal medium which has the following composition :—

Extract of 125 gm. of ox or horse flesh in 1,000 cc. of Aq. dest.
20 gm. of agar.
20 gm. of peptone.
5 gm. of Nacl.
10 cc. of normal soda solution.

As the degree of acidity of the extract of meat solution is very variable the author decided, instead of adding 10 cc. of normal sodium carbonate solution, to render the medium neutral to litmus and then add 5 cc. of normal sodium carbonate solution in excess.

To the medium prepared in this manner 2 per cent. of dextrose was added as recommended by BASS, ZIEMANN and others for the cultivation of malaria parasites and *Piroplasma canis*. In each test tube, containing 3 to 4 cc. of the medium, was added twice or thrice the volume of sterile defibrinated blood. Details are given of the technique employed to obtain sterile defibrinated blood. In order to prevent evaporation of the water of condensation paraffin was found to be preferable to rubber caps, wax and sealing wax.

The trypanosomes used by the author in his experiments were *T. brucei* (strain Ferox) and the East-Prussian strain of Beschälseuche, *T. equiperdum*. The blood was collected in capillary tubes with sterile precautions from the beating heart of heavily infected rats and mice. It was mixed with an equal quantity of physiological salt solution and two or three drops of the diluted blood were added to the nutrient medium. In this way bacterial-free cultures were obtained. The tubes were kept in the dark at room temperature.

The author gives the following summary of his results :—

Cattle trypanosomes of the type of *T. theileri* multiply only for the first generation in cattle blood media at 37° C. On the other hand subcultures of this species of trypanosomes were successful on the Novy medium prepared with goat blood.

Dextrose exerts a beneficial influence on the vitality and the capacity for multiplication of pathogenic trypanosomes *in vitro*.

On the addition of dextrose, it was found that not only do other kinds of blood (goats, horse, donkey and calf) replace the costly rabbit blood but

they even surpass it. In rabbit blood media dextrose is without beneficial influence.

On dextrose media pathogenic trypanosomes preserve their infectivity but their virulence diminishes.

Several passages through artificial media do not make pathogenic trypanosomes more suitable for culture *in vitro* but decrease their vitality and quickly diminish their virulence.

T. brucei preserves its virulence in cultures better and more regularly than *T. equiperdum*.

W. Y.

BROWN (Wade H.). **A Note on the Pathogenicity of** *Trypanosoma lewisi.*—*Jl. Experim. Med.* 1914. Apr. 1. Vol. 19. No. 4. pp. 406-410.

The author reviews the previous evidence concerning the pathogenicity of *Trypanosoma lewisi*, and concludes that pathogenic strains of the parasite exist and that "possibly all strains possess potential pathogenic properties." He, personally, worked with a strain of *T. lewisi* "that, for a short time, showed an unusual increase in its virulence." The trypanosome was isolated from "a natural infection in a wild rat and has been carried for several years in white rats with no unusual manifestations of virulence. In October, 1913, for three successive generations, fatal infections resulted from the intraperitoneal injection of one to two drops of tail blood, diluted with 1 cc. of a 1 per cent. sodium citrate solution, death taking place 8 to 11 days after inoculation. Five rats out of the six inoculated succumbed to this infection."

A large rat infected with this strain of *T. lewisi* was bled to death and 10 normal rats were inoculated intraperitoneally with its blood. Of these, one rat died in 48 hours, and the autopsy showed a marked bronchiectasis, while another showed only a transient trypanosome infection. The remaining eight rats showed a rapid increase of the trypanosomes, and the infection terminated fatally between the sixth and ninth days. "The rats became torpid and weak, with marked anaemia and dyspnoea, and slight loss of weight. A few rats showed bloody nasal and lachrymal discharges, and all of them developed a diarrhœa with greater or less abdominal distension." Autopsies on these rats showed marked splenic enlargement and hyperplasia of the bone-marrow, and a few foci of necrosis in the liver.

When the above strain became slightly less virulent it was compared with another strain of *T. lewisi* recently isolated, by inoculating five rats with each strain. None of them died, but the first strain was the more virulent.

The author concludes that :—

"1. Some strains of *Trypanosoma lewisi* may, at times, produce rapidly fatal infections in a large percentage of the rats infected.

"2. In such strains of *Trypanosoma lewisi*, a sufficient degree of pathogenicity may persist to warrant the designation of these strains as pathogenic.

"3. The pathogenicity of a given strain of *Trypanosoma lewisi* is not constant, but is subject to marked and even sudden variations."

H. B. F.

KALA AZAR.

WENYON (C. M.). **Kala Azar in Malta, with some Remarks on the Various Leishmaniases.**—*Trans. Soc. Trop. Med. & Hyg.* 1914. Jan. Vol. 7. No. 3. pp. 97-111. With 1 plate.

Kala azar was first shown to exist in Malta by CRITIEN (1910), who pointed out that the disease in children had long been known under the name of "*marda tal biccia.*" He also discovered that the dogs in the island were liable to leishmaniasis. The author confirmed CRITIEN's findings, seeing during his stay in Malta seven cases of the disease in children.

The question of the identity of Indian and Mediterranean kala azar is discussed. The natural freedom of dogs in India from the disease, Wenyon believes, may probably be due to the fact that the transmitting host is not the same as that in the Mediterranean and is one which is not in the habit of feeding on dogs. Whether this be so or not, it is now known that dogs can be infected experimentally with virus both from Indian and Mediterranean cases. If due regard is paid to the symptomatology and distribution of the disease, the morphology of the parasite and infection of animals, it can hardly be onger maintained that kala azar as it exists in India is a disease ldifferent from that in China, Europe, Africa and even South America.

Dealing with the question of etiology the author states that a great deal of doubt as to the mode of transmission of the parasite still exists. In Europe BASILE claims to have transmitted the disease to dogs by means of fleas collected from infected dogs and from the houses of kala azar cases. It is pointed out that these experiments were remarkable in that they were invariably followed by positive results, a most unusual occurrence in connection with such experimental work. Further there is a fallacy in experiments of this kind, for the dogs employed were those of a country in which the natural canine disease exists. The author accordingly had four young dogs sent out from England. Immediately upon their arrival, two of them were enclosed in a mosquito-proof cage and two in an unprotected cage about 15 yards distant. Over 300 fleas transferred from an infected dog were allowed to bite the animals in the protected cage. These finally died, but at the autopsy there was no suggestion that they had been suffering from kala azar. A careful examination of smears of the liver, spleen and bone marrow failed to reveal any leishmania, nor did any flagellates develop in tubes of NNN medium inoculated from these organs. The control dogs in the neighbouring cage remained perfectly healthy. This experiment therefore lends no support to the flea transmission hypothesis. The author suggests that the transmitting host in Malta is most probably a biting arthropod. The fact that parasites may escape from the body by way of the gut is mentioned and it is suggested that investigation might be made on these lines by feeding monkeys and dogs on infected organs. Outside the body the leishmania are not very resistant.

In diagnosing kala azar and oriental sore it may be difficult to find the parasites on microscopic examination. In Wenyon's experience with experimental animals the inoculation of tubes of NNN medium from the organs has given rise to a culture of flagellates, when micro-

scopic examination of the same organs has been negative. (See also p. 550).

The author believes that kala azar, whether in children or adults, in all parts of the world is caused by the parasite *Leishmania donovani*, while oriental sore is caused by *Leishmania tropica* in the old world and probably also in South America, though this cannot be regarded as finally settled.

G. C. Low.

LIGNOS (Antoine). i. **De l'Epoque de l'Apparition du Kala Azar à Hydra.**—*Bull. Soc. Path. Exot.* 1914. Jan. Vol. 7. No. 1. pp. 45-46.

ii. **Troisième Cas de Guérison de Kala Azar infantile observé à Hydra.**—*Ibid.* pp. 43-45.

iii. **La Mortalité par Kala Azar à Hydra pendant l'Année 1911.**—*Ibid.* Mar. No. 3. p. 193.

i. Of 37 cases of infantile kala azar occurring in Hydra during the four years 1910–1913 the great majority showed their first sign of infection during the cold weather (October to March), with a maximum in the month of February.

ii. In a former paper the author recorded one case of recovery from kala azar of 13 cases seen in Hydra during 1911, eleven of whom had died and one other was still living. This case has now completely recovered. The author concludes that (1) Recovery from infantile kala azar is not rare, since of six cases seen in 1910 one recovered and of 13 seen in 1911 two have recovered; (2) Dark pigmentation of the skin is not an uncommon feature of the disease, for it has been shown by two of the 19 cases seen in 1910 and 1911.

iii. During the year 1911 among children under 6 years there were 36 deaths. Of these 14 were shown by microscopic examination to have died of kala azar. Thus 39 per cent. of the infantile mortality is due to this disease. The total population of the island is 6,000. In order to check this high mortality rate, the author advocates the extermination of all the dogs of the island.

C. M. Wenyon.

PITTALUGA (Gustavo).—**Kala-Azar infantile e Leishmaniosi canina in Ispagna.**—*Pathologica.* 1914. Mar. 1. Vol. 6. No. 128. pp. 121-123.

The author points out that since his discovery of the infantile form of kala azar at Tortosa near the mouth of the river Ebro on the east coast of Spain (see this *Bulletin*, vol. 2, p. 443) other cases have been recorded at various places along the southern and eastern coasts. He now records further investigations on the subject. In conjunction with Garcia del DIESTRO he has obtained culture of the parasite in the usual way in NNN medium. As a result of the examination of dogs in the neighbourhood of Tortosa two have been found suffering from kala azar. A third infected dog has been noted from Beninar in the province of Almeria. Cultures have been made of the canine parasites.

C. M. W.

CONOR (A.) & CALÔ (E.). **Le Troisième Cas de Kala-Azar d'Origine algérienne.**—*Bull. Soc. Path. Exot.* 1914. Jan. Vol. 7. No. 1. pp. 42-43.

In this paper there is placed on record a case of kala azar in a child aged three years, the third case of the disease to be discovered in Algeria.

C. M. W.

CANNATA (S.). **Ulteriori Ricerche sulla Presenza del Parassita di Leishman nel Sangue periferico di Bambini affetti da Leishmaniosi.**—*Pediatria.* 1914. Jan. Vol. 22. No. 1. pp. 27-32. With 1 plate.

In previous papers (see this *Bulletin,* Vol. 2, p. 436) the author reported his discovery of leishmania in the peripheral blood of cases of Mediterranean kala azar and showed that parasites could be found in ordinary blood films, provided care was taken to examine patiently many films from each case. In this paper the author tells us he has continued his examinations with a result that he has demonstrated parasites in the peripheral blood of 15 out of 16 cases of the disease in children. Attempts at cultivating parasites from the peripheral blood of five cases on NNN medium failed. The parasites, as they occur in the mononuclear or polynuclear cells or free in the plasma owing to rupture of the cells in film making, are shown in four excellent microphotographs.

C. M. W.

WHIPHAM (T. R.). **Case of Kala-Azar.**—*Proc. Roy. Soc. Med.* 1914. Feb. Vol. 7. No. 4. Section for the Study of Disease in Children, pp. 63-64.

This case is chiefly of interest in that it illustrates that the Indian form of the disease occurs in children, a feature which appears to be more characteristic of the Mediterranean type. The patient was a boy aged five years who first became ill in Calcutta in March, 1913. The father of the boy contracted the same disease in Calcutta a year ago and has since died. Both cases were diagnosed by the finding of *Leishmania donovani* on liver puncture. When the boy was shown at the Society he had improved in health for some weeks. [It is known to the reviewer that the child subsequently died.]

C. M. W.

GABBI (U.). **Il Kala-Azar Indiano e Mediterraneo sono Identici. Nuove Indagini Sperimentali.**—*Malaria e Malat. d. Paesi Caldi.* 1914. Jan.-Feb. Vol. 5. No. 1. pp 14-22: and *Pathologica,* 1914. Feb. 1. Vol. 6. No. 126. pp. 69-74.

In this paper the author shows how the various arguments which have been employed to establish the non-identity of Indian and Mediterranean kala azar have gradually been disproved. He refers to the experiments of DONOVAN and PATTON, who succeeded in infecting Indian dogs by injecting large doses of *Leishmania donovani.* In order to test whether Indian dogs were also inoculable with the

virus of Mediterranean kala azar, the author has obtained three dogs from Bombay which were sent to him in Italy.

Experiment 1. Dog 3,800 grams in weight on July 3rd was injected intraperitoneally with 3 cc. of spleen juice from a child suffering from kala azar. The dog remained in good health and gained in weight to 4,900 grams. On September 15th it was reinoculated in the liver with 3 cc. of spleen juice containing numerous leishmania. The dog was killed on November 24th when it weighed 5,200 grams. Parasites were found in small numbers in one smear of the liver and in four of the bone marrow. Six tubes of NNN medium inoculated from the liver, spleen and marrow were negative.

Experiment 2. Dog 5,600 grams in weight on July 5th was injected intraperitoneally with 2·5 cc. of spleen juice. On November 17th, when the dog had increased in weight to 6,700 grams, it was reinoculated subcutaneously with 2 cc. of spleen juice containing numerous leishmania. The dog was killed on December 7th. No leishmania were found in any organ and cultures from the spleen, liver and marrow were negative.

Experiment 3. Dog 7,500 grams in weight was inoculated on July 6th intraperitoneally with 2·5 cc. of spleen juice rich in leishmania. On November 25th it was reinoculated subcutaneously with 2·5 cc. of spleen juice and again on November 28th intraperitoneally with 3 cc. The dog was killed on December 16th. Numerous leishmania were found in the smears of the spleen and marrow but none in the liver. Cultures from the spleen, liver and marrow curiously enough were negative.

It has thus been demonstrated that the dogs of India are susceptible to the virus of Mediterranean kala azar to just the same extent as they are to the virus of Indian kala azar as demonstrated by the experiments of Donovan and Patton, so that there is no longer any reason to regard the two forms of disease as distinct.

C. M. W.

Laveran (A.). **Nouveaux Faits tendant à démontrer que le Kala-Azar Méditerranéen doit être identifié au Kala-Azar Indien.**—*Compt. Rend. Acad. Sciences.* 1914. Apr. 14. Vol. 158. No. 15. pp. 1060-1064.

In this paper the author reviews his experiments on monkeys, dogs and mice with the virus of Mediterranean and Indian kala azar.

Monkeys. Twelve monkeys (*M. sinicus* and *M. cynomolgus*) were inoculated with Mediterranean virus. Of these two had a general infection which proved fatal, six had mild infections and four remained uninfected. The percentage of infections was 66·6 per cent. Eight monkeys were inoculated with Indian virus and of these six contracted the disease, a percentage of 75.

Dogs. Thirty-three dogs were inoculated with Mediterranean virus and 28 became infected. The percentage was 84·8. Of ten dogs inoculated with Indian virus seven were infected, a percentage of 70.

Mice. Twenty-six mice were inoculated with Mediterranean virus. In 21 of these there resulted a general infection. Three mice inoculated with Indian virus all had a general infection.

One monkey (*M. cynomolgus*) was inoculated with Mediterranean virus on April 24th, 1909. Splenectomy was done on October 30th, 1909. The spleen was infected with leishmania. On August 23rd (1910 ?) the monkey was in good condition and was reinoculated with a large dose of Mediterranean virus. This had no result. On November 8th, 1913, it was inoculated with Indian virus at the same

time as another monkey (*M. cynomolgus*). The previously inoculated monkey did not become infected, whereas the control became infected and died. Post mortem its organs contained large numbers of leishmania.

These experimental results all speak in favour of the identity of Indian and Mediterranean kala azar.

C. M. W.

DA SILVA (Pereira). **Notes sur le Kala-Azar.**—*Arquivos do Inst. Bacteriol. Camara Pestana.* 1913. Vol. 4. No. 2. pp. 147-172. With 2 coloured plates and 3 text figs.

The first case of kala azar in Portugal was in a child aged 9 years from Lisbon. The case was supposed to be one of tuberculosis of the spleen and laparotomy was performed. When no tubercular lesions were discovered it was decided to remove the spleen, and in smears of the removed organ Dionysio ALVAREZ (March, 1910) discovered leishmania. Since that date nine other cases, all in young children, have been brought to light. They have all been inhabitants of Lisbon or places within a radius of 28 kilometres of Lisbon.

An extensive examination of the dogs of Lisbon was undertaken with a result that of 416 dogs examined from various parts of the town 13 were found to have canine kala azar. The diagnosis in every case was made by the finding of leishmania in smears (spleen, bone-marrow and liver).

Inoculation Experiments. From the spleen of a case of kala azar a dog was inoculated intrahepatically with 2 cc. of emulsion. The dog became infected as demonstrated by liver punctures. Eventually parasites were no longer found on liver puncture and, as the dog appeared perfectly well, it was killed eight months after inoculation, when scanty parasites were found in the spleen and marrow only.

Six dogs were inoculated either intrahepatically or intraperitoneally or both ways from the spleens of dogs suffering from natural canine kala azar. Four of these received a second inoculation of the same kind some months later, and of these four three were found infected when killed. Of the two dogs which received but one injection one was infected.

Three other dogs were subinoculated from the spleens of some of the dogs which had been successfully infected. All three became infected and in one of these the disease was very rapid and ended fatally in two months. This dog had a most intense infection, parasites being found in the spleen, liver, bone marrow, mesenteric glands, lungs and kidneys. In the spleen and marrow the parasites were present in extraordinary abundance.

As a result of these experiments the author finds that the disease of children and that of dogs are both inoculable to dogs and that other dogs may be infected by subinoculations. In dogs the spleen and marrow are most intensely infected, and a safe diagnosis can only be made in dogs by examination of one of these, by laparotomy for the spleen or bone puncture for the marrow. Liver puncture has been most unreliable as a means of diagnosis. As regards the symptoms in the infected dogs the author finds that there are generally none and that there is no loss of appetite, while the animals usually put on flesh.

They are happy and show no nervous or motor troubles nor depression of the body temperature. Two of the dogs, which were only one month old when inoculated and had a very intense infection, showed nothing of the hypothermia, loss of appetite, wasting, tremors, motor troubles or diarrhoea supposed by BASILE to characterise the acute infection of young dogs. When such symptoms as loss of hair, wasting, thickening, wrinkling and scabbing of the skin, and motor troubles of the hind limbs appear, they are due undoubtedly to mange and not to the infection with leishmania. In the case of the dog referred to above as having had an acute infection with enormous numbers of parasites in the organs the only symptoms were wasting and a purulent condition of the eyes. The appetite remained quite good. Of all the dogs infected only two could be said to have died of the disease. Others died as a result of the skin disease due to *Demodex folliculorum.* Cultures and subcultures of the leishmania from these various dogs were readily obtained on NNN medium.

Transmission experiments. Eighty fleas (*Ctenocephalus canis*), caught on two of the experimentally infected dogs, were examined for flagellates and three were found infected with round forms very like the parasites in the spleen and marrow smears of infected dogs. Some of the longer forms had short flagella. No further dissections of fleas from these dogs were made as the author wished to use the fleas for transmission experiments. For examination of the faeces of the fleas he used a small flattened glass vessel the mouth of which could be covered completely by an ordinary microscope slide. Round the vessel's mouth was a band of metal which was continued beyond the vessel on each side so that, when this continued portion was turned over, it formed a slot into which the glass microscope slide could be slipped and held in place against the mouth of the vessel. The flea to be examined is dropped into the vessel, the slide is slipped in and the vessel inverted so that the flea is compelled to rest on the slide. When faeces have been deposited on the slide the vessel is again turned up and the flea falls to the bottom and cannot escape while the slide is removed. The faeces after mixing with a little saline are spread, dried and stained.

The author gives a description of the various forms of flagellate found and illustrates them by a coloured plate. They differ very little, if at all, from the forms found in cultures of leishmania. Having found three fleas from kala azar dogs infected with flagellates, while none of 60 fleas from healthy dogs were infected, the author originally concluded that the flagellates must have developed from the leishmania of the dog. It is now however known that fleas may be infected apart from kala azar in dogs, so that the author admits that he cannot any longer hold that the flagellates in the fleas are such as he originally supposed them to be. On the other hand he cannot state that they are not such. With these fleas he has undertaken transmission experiments.

Experiment 1. A dog which was born on March 18th, 1911, was subjected to laparotomy on April 18th. Its spleen was exposed but not removed and preparations made from the spleen pulp. It was not infected with leishmania and recovered from the operation. On April 27th it was enclosed with two dogs which had been just inoculated from another dog. Both these dogs were found infected by marrow puncture on May 25th. The three dogs continued to live together and fleas caught off the two

infected dogs were placed on the healthy dog. On June 8th 71 fleas were transferred. Between June 14th and June 22nd 115 fleas in six batches were transferred. The faeces of each batch were examined by the glass jar method and three batches were found infected with flagellates. On July 1st and 31st and August 31st the marrow of the femur of the dog was examined with negative result. The animal died of mange in December and leishmania were not present in any of the organs. This dog, a very young one, had thus lived for four months in contact with two heavily infected dogs and 185 fleas were actually transferred (in addition to fleas which were passing from one to the other naturally) without the dog contracting the disease.

Experiment 2. A dog aged one month was found by marrow puncture to be free from leishmania. On July 20th the dog was injected subcutaneously with two lots of flagellate infected faeces from fleas taken off infected dogs. Two other injections of the same kind were given on July 26th and again on August 1st and 4th. On August 30th bone marrow examination was negative. The dog was killed in October and no leishmania were found.

Experiment 3. In July, 1912, 101 *Ctenocephalus canis* were taken off a dog which was not infected with leishmania, and in 4 of these there were flagellates indistinguishable from those previously found in fleas off kala azar dogs.

As this demonstrated that flea dissections alone could give no result, the author determined to control his fleas by fixing them on wires by Nöller's method.

A. 45 fleas (*Pulex irritans*) were fixed on wire and were fed for fifteen days on a healthy dog. The faeces were free from flagellates. They were then fed during one and a half months on a heavily infected dog and the faeces were constantly examined. Some of the fleas died during the experiment and owing to negligence of the laboratory assistant all the surviving 25 died at the end of the one and a half months. They had been kept at laboratory temperature but never had acquired any flagellate infection.

B. 22 fleas (8 *P. irritans*, 14 *C. canis*) were fed on a healthy dog for 15 days without any infection being found by faeces examination. They were then fed on an infected dog and after 8 days three of the *C. canis* had flagellates in their faeces. The fleas were then fed regularly on a young uninfected dog. When they died or were dying the fleas were dissected and the three mentioned above were found still infected with flagellates. The flagellates were taken up in saline solution and inoculated into the liver of a healthy dog. This dog died one month later. Examination of the spleen and marrow by smears and culture on NNN medium was negative. The dog on which the flagellate infected fleas had fed also remained uninfected.

C. From the dog mentioned above as having a very severe infection another dog was inoculated and on it two weeks later 33 fleas (16 *P. irritans* and 17 *C. canis*) commenced to feed. Five days later one of the *C. canis* had flagellates in the faeces. This flea had not had its faeces tested before feeding. It was found however that the dog had not become infected, though it had been inoculated from the very heavily infected dog, so there was no question of this flea having acquired its flagellates from the dog. The flagellates of this flea were inoculated into a young dog. Into the same dog were inoculated flagellates found in fleas (*P. irritans*) taken off a case of kala azar in a child. The dog was kept under observation for four months and the marrow by smear and culture was always negative.

D. 20 *Pulex irritans* were caught off healthy individuals. In the faeces of one flagellates occurred. The flea was fed on a young dog for 28 days after which it died. The dog was then made to eat the flea. The dog acquired no infection.

In these experiments with fleas, apart from the three fleas (*C. canis*) under heading B, there is no question of any of them having become infected from the leishmania of the dogs. The three fleas which later

showed flagellates (see B above) may have themselves had previously a very small undetected infection. If the flagellates which appeared were leishmania, then the dog into which they were injected should have become infected.

[These experiments, which appear to have been laboriously conducted with every care and control, do not lend any support to the numerous successful flea transmission experiments carried out on dogs by BASILE in Italy.]

C. M. W.

SALVATORE (Domenico). **Colture di Leishmania hominis iniettate nel Peritoneo dei Cani.**—*Malaria e Malat. d. Paesi Caldi.* 1914. Jan.-Feb. Vol. 5. No. 1. pp. 29-32.

The author records an attempt made by him to infect ten young dogs by the intraperitoneal injection of young cultures of leishmania from a case of Mediterranean kala azar. Four of the dogs died on the second, sixth, seventeenth and forty-fifth days respectively. The six remaining were killed after eighty or ninety days. All were examined after death for evidence of infection, but the result was invariably negative. Cultures were made from the liver, spleen and bone marrow but no flagellates developed. It is evident that the dogs did not become infected.

C. M. W.

WENYON (C. M.). **The Culture of Leishmania from the Finger-Blood of a Case of Indian Kala-Azar, with some Remarks on the Nature of Certain Granular Bodies recently described from this Disease.** – *Jl. Trop. Med. & Hyg.* 1914. Feb. 16. Vol. 17. No. 4. pp. 49-51.

The author confirms MAYER and WERNER's work on the possibility of obtaining cultures of leishmania from the peripheral blood in cases of Indian kala azar (see this *Bulletin*, Vol. 3, p. 136). Six tubes of NNN medium were inoculated with two or three drops of finger blood obtained from a case of kala azar in whom repeated examinations had failed to reveal parasites in the peripheral blood. The diagnosis however had been confirmed by the demonstration of parasites in the blood obtained by liver puncture. The tubes were incubated at a temperature of 23°–25° C. and were examined from time to time. On the sixth and eleventh days no growth of flagellates was noted. On the eighteenth day five of the tubes were free from bacteria and flagellates were present in these in such numbers as to be easily seen with low powers of the microscope.

Similarly a case of tropical sore, which showed no parasites microscopically, gave positive results by cultivation methods. The author believes that this development and multiplication of leishmania in the test tube demonstrates the possibility of the true invertebrate host becoming infected from the peripheral blood. He further points out the value of the method as a means of diagnosing any leishmanial disease, especially kala azar, where spleen or liver puncture cannot be undertaken and where nothing is found in the peripheral blood. The mode of preparation of the NNN medium is as follows :—

14 grammes of agar, 6 grammes of salt and 900 cc. of distilled water are dissolved in the usual manner and distributed without filtering in test

tubes (1 inch in each tube). The tubes are then plugged and sterilized in the autoclave. A rabbit is next killed with chloroform and laid out on its back, the thorax being painted with a solution of iodine. The heart is then exposed with sterile instruments and a sterile 20 cc. syringe with a large needle is plunged into it and the blood drawn up.

The agar tubes, which have been cooled to below 50° C. and in which the agar is still liquid, are held and opened by an assistant and into each about 1 cc. of blood is introduced. The tubes are then rolled in the hand to mix the still liquid agar and blood and subsequently are sloped. When solid they are incubated at 37° C. for 24 hours to determine their sterility. Inoculation is made into the water of condensation which is collected in the tubes and after this has been done they are incubated at a temperature of 22°–25° C., evaporation being prevented by covering them with a rubber cap. In order to watch the progress of the growth of leishmania parasites in them, all that is necessary is to remove a small quantity of the liquid on a platinum loop, place it on a slide and examine it with a $\frac{2}{3}$ or $\frac{1}{6}$ inch objective with the condenser down; the flagellates can then be easily seen. Care must be taken to prevent bacteria gaining access to the tubes, as they will kill the parasites.

Recent work by Archibald in the Sudan and by Statham and Butler on the West Coast of Africa is commented on (this *Bulletin*. Vol. 2. p. 119 and Vol. 3. p. 137). The first of these observers discovered in the spleen and liver of kala azar cases blue-staining protoplasmic masses containing purple staining granules in varying numbers, but no leishmania; the latter have described similar bodies from the liver of a case of splenic enlargement in West Africa and suggest that they possibly represent the schizogonic stage of some protozoon. Similar bodies have been described by Smallman from the liver of cases of Mediterranean kala azar. The author believes that these observers have produced no evidence whatsoever to prove that the granules seen by them are parasitic. He points out that because protozoa consist of protoplasm and chromatin it must not be forgotten that the cells of the higher animals consist of the same two substances, and in smears stained with Romanowsky's stain the cytoplasm, whether a protozoon or the cell of a higher animal, tends to stain blue while the chromatin and other granules stain varying shades of red and purple, for protoplasm is essentially the same wherever it occurs. Lately, while working experimentally with leishmaniasis in animals, Wenyon has encountered in liver smears the bodies described by the authors mentioned above. Sometimes these were exact reproductions of Archibald's bodies; at other times they could not be distinguished from those figured in the papers of Statham and Butler, and Smallman. Examination of the livers of uninoculated dogs and rats, however, showed that exactly the same bodies might occur, so this did away with any possibility of their being connected with leishmania. After a careful examination of many films the author is convinced that the bodies in question are merely detached portions of the cytoplasm of large cells which are themselves charged with granules. The exact staining of these varies very much, and depends largely on the extent of disintegration of the cells and the amount of flattening to which they have been submitted in the process of film making.

G. C. L.

PRICE (J. Dodds) & ROGERS (Leonard). **The Uniform Success of Segregation Measures in Eradicating Kala-Azar from Assam Tea Gardens. Its Bearing on the Probable Mode of Infection.**—*Brit. Med. Jl.* 1914. Feb. 7. pp. 285-289.

During 1906–7 the epidemiology of kala azar in the tea gardens of the Nowgong district of Assam was investigated by the authors. Previous to this Dodds Price had realised that the coolie lines were being gradually infected from the villages, and as early as 1895 built new coolie lines for a number of freshly imported coolies arriving on the Rangamati tea estate. Rogers commenced his investigations in 1896 and independently arrived at conclusions similar to those held by Dodds Price. In 1897 the authors investigated together the result of the new lines on the Rangamati estate. It was found that no case of kala azar had occurred among 150 coolies who had resided there for 2 years, yet of 50 coolies of the same batch who had for want of room been compelled to live in the old lines no fewer than 16 per cent. were already dead of kala azar, while others were suffering from the disease and that in spite of the fact that the new lines were only 300 yards distant. A further experiment was, therefore, carried out at the Old Solona out-garden lines of the Rangamati estate. It was decided to remove only those who had no cases of disease in their families. Of 240 it was only possible to remove 96 to the new lines and of these five were sent back owing to developing fever. The new lines were further filled up with freshly imported coolies to the number of 800 persons, all of whom to this day—that is for sixteen years—have remained free from kala azar. Of those left behind in the old lines [the authors state 96 but they evidently mean the 144 left behind plus the 5 that had to be sent back] all died during the next few years. Kala azar, moreover, spread to a contiguous line with 60 healthy coolies, who had worked for years on the estate and refused to move into the new lines. One third of these died during the next fifteen months, and the rest all succumbed or left the estate during the few succeeding years. The new lines, which have remained free for 16 years, are only 400 yards away from the old ones.

The success of these early experiments encouraged the tea garden managers to allow Dodds Price to repeat the procedure in connection with coolie lines infected with kala azar. The authors have recently studied the result of these undertakings and, as they have been uniformly successful, they prove the soundness of the measure and render it one of the first importance in dealing with this disease. The general results are given in a Table and this, with the authors' remarks concerning it, is reproduced.

"In order to bring out the facts in as condensed and convenient a form as possible, the most essential data, as far as they are available, regarding the infected Nowgong tea gardens are shown in Table 1. Column 1 shows the working population of each line at the present time, to which must be added from 20 to 25 per cent. to allow for young children. Then follow the dates on which the lines became infected with kala azar; the approximate number of deaths before the lines were moved, the figures being on the conservative side, and to some extent under-estimating the real loss; succeeding columns give the years in which the new lines were built, which was almost always in the non-manufacturing cold season; the approximate number of persons with infection in their households, who were left on the old site or in a segregation camp, and the number of deaths from kala azar which subsequently occurred among them. The

distance of the new lines from the old infected ones and the number of years which the new lines have now remained free from the disease complete the table. As there have been no material extensions of the area under tea in the Nowgong district during the period of time dealt with, owing to the difficulty in increasing the labour force, the present working population of the coolie lines is much the same as formerly. It thus appears that in the ten lines shown in Table 1 kala azar has been stamped out of a labour force of nearly 7,000 workers, after it had caused a mortality within a few years of 207 per mille, and although, subsequently to moving the coolie lines, over half of the infected households which had to be left behind on the infected sites died of the disease. As it costs from £7 to £14 to recruit a coolie, and the average duration of the illness is at least seven months, during which food and treatment costs £4, it is clear that, in addition to the great saving of life and suffering, the financial aspect of the case to the tea industry is of great importance."

TABLE 1.

Tea Estate.	Working population.	Year of infection.	Deaths before the lines were moved.	Year of removal.	No. of infected left behind.	No. of infected who died later.	Distance the lines were moved.	No. of years the new lines have remained free.
New Rangamati	622	—	—	1895	—	—	300 yds.	18 yrs.
Old Salona (Rangamati)	800	1893	over 200	1897–8	140	fully 112	400 yds.	16 yrs.
Haspani ..	625	1897	about 75	1899	over 100	at least 60	800 yds.	14 yrs.
Kondoli ..	600	1892	over 150	1901	?	a few	—	12 yrs.
Kellydene ..	900	1895	320	1902–3	about 160	about 75	750 yds.	9 yrs.
Amlucki ..	1,800	1896	350	1900–1	about 100	47	½ mile	13 yrs.
Lung Soong ..	540	1902	about 35	1904–5	about 35	15	800 yds.	8 yrs.
Nonoi	312	1893	about 85	1905–6	about 40	about 12	¾ mile	8 yrs.
Meesa	550	1896	over 50	1905–6	25	17	600 yds.	8 yrs.
Seconee ..	678	1908	128	1911	98	23	600 yds.	2½ yrs.
Totals ..	6,727	—	1,393	—	698	361	—	—
Deaths per mille ..	—	—	207	—	—	517	—	—

That the improvement which resulted immediately upon removal to new lines was not due to any decline in the epidemic of the disease is clearly shown by the fact that the removals were not all carried out at the same time in the different lines, and further absolutely conclusive evidence to the same effect is furnished by two control coolie

lines which have not been moved and which still suffer from the disease to the present moment. In connection with one of these a kala azar camp was started in 1897, to which all evident and suspected cases of the disease were removed. The effect of this was to cause a drop in the number of cases from the lines during the four following years. In 1900 the segregation camp was broken up, whereupon the cases in the lines again began to increase. In 1905 disinfection directed towards the destruction of bed bugs in all the infected houses was undertaken, with the result that there was a marked decrease for six years. In 1901 a distinct recrudescence of the disease took place, while in 1913 there have been more deaths than in any year since 1899. It is thus clear that the partial measures adopted in the case of one estate have failed to eradicate the disease, and it is evident that so long as fresh material in the form of newly imported coolies is introduced into infected lines so long will the disease continue.

On the subject of the probable mode of infection the authors point out that the foregoing facts are of the greatest importance, for they prove that a few hundred yards are sufficient for permanent protection from kala azar, though a disease like malaria, which is carried by a flying insect, soon becomes as rife in the new as it was in the old lines. That water supply has nothing to do with it is shown by the fact that in several instances improvement has resulted though the old water supply has still been used by those in the new lines. For similar reasons food supply can be excluded. The authors conclude therefore that the bed bug, which clings to the old houses, is the most likely carrier of the disease. The somewhat slow spread compared with the rapid extension of malaria is explained when we consider the rarity with which the parasite of kala azar appears in the peripheral blood and the small percentage of bugs which become infected after actually taking up parasites, as demonstrated by the experiments of Patton.

With regard to the permanency of recoveries from kala azar the authors state that one of them (Dodds Price) during 20 years experience has followed upwards of 2,000 cases from first to last on tea estates, and can personally vouch for over 150 permanent and complete recoveries in which the patients continue to do full work for years. These recoveries have resulted from no special line of treatment, but in their experience the authors find that if a kala azar patient who has reached the typical advanced stage of the disease with great emaciation once loses the fever, puts on flesh steadily for several months, and becomes well nourished, he or she will recover.

C. M. W.

Canine Leishmaniasis.

i. Pringault (E.). **Existence de la Leishmaniose canine à Marseille.** —*Bull. Soc. Path. Exot.* 1914. Jan. Vol. 7. No. 1. pp. 41-42.

ii. Laveran (A.). **Au Sujet d'un Cas de Leishmaniose canine signalé à Marseille.**—*Ibid.* Mar. No. 3. pp. 173-174.

In the former of these papers the author records the examination of fifty stray dogs in Marseilles for evidence of leishmania infection. In one, very much emaciated, a large infection of the bone marrow was found.

In the second paper Laveran points out that it is possible that this

dog was one imported from some place where canine kala azar was endemic. He draws attention to the importance of preventing the importation of this disease in dogs.

C. M. W.

CARONIA & DI GIORGIO (G.). **Sulla Leishmaniosi Spontanea nei Cani di Palermo.**—*Pathologica.* 1914. Apr. 15. Vol. 6. No. 131. pp. 208-209.

The examination of dogs in Palermo, Sicily, has been continued, with the result that the authors of this paper have encountered one case of canine kala azar out of 1,005 dogs examined. Previously JEMMA had examined 300 dogs from Palermo and its suburbs and had met with two cases.

C. M. W.

LEMAIRE (G.), SERGENT (Ed.) & LHÉRITIER. **La Leishmaniose naturelle du Chien à Alger. Etude clinique et anatomo-pathologique.** *Rev. Méd. d'Alger.* 1914. Jan. pp. 1-14. With 3 text figs.

This paper contains an account of the authors' experience of canine kala azar in the neighbourhood of Algiers. On account of the difficulty of diagnosing the disease in its early stages in dogs they are unable to fix any period of incubation. They recognise the disease as being of three types—the benign infection, the infection of moderate severity, and the acute infection.

Benign Infection. In this form of the disease the infected animals appear in good condition and examination of the organs reveals no leishmania or only very few. Sometimes in such cases culture on NNN medium from the marrow gives a positive result. The authors find that not infrequently dogs living in association with cases of kala azar have become wasted and lost their fur, but later have recovered completely except possibly for lesions of the eyes and ulcers about the eyes, nose and ears. In these cases it may be impossible to demonstrate leishmania either by culture on NNN medium or by examination of smears of the organs, yet the authors suspect that these have been cases of canine kala azar ending in recovery.

Medium Infection. Of all the types this is the most commonly seen. It usually ends fatally after a year or sixteen months. The dogs show an increasing emaciation and there results an extreme muscular weakness of the hind limbs so that the animal may be unable to stand. The hair is shed in patches or may come off entirely. At the angle of the mouth and eyes and upon the nose ulceration is common, while a frequent complication is keratitis resulting in opacity of the cornea. In spite of all this the appetite remains good till near the end, which is preceded by hypothermia and often diarrhoea. The spleen is found to be soft and hypertrophied or firm and hard, according as to whether the animal has or has not lived long enough for a terminal sclerosis to develop. The liver may also be sclerosed in later stages of the disease. The bone marrow is red in colour.

Acute Infection. In the acute infection there is a rapid wasting without there being any other symptom. The diagnosis can only be made by the actual discovery of leishmania, which occur however in such extraordinary numbers that frequently the cells of the organs

seem to be actually replaced by them. Dogs having the acute form of the disease usually die in a few weeks.

C. M. W.

LEMAIRE (G.), SERGENT (Ed.) & LHÉRITIER. **Spécificité de la Kératite observée chez les Chiens atteints de Leishmaniose naturelle.**—*Bull. Soc. Path. Exot.* 1914. Mar. Vol. 7. No. 3. pp. 193-196.

The authors insist upon the importance of keratitis as a sign of canine kala azar, since they have met with it in the case of three dogs naturally infected in Algiers. In some cases this sign may lead one to suppose such an infection even when leishmania cannot be discovered. In sections of the cornea it is noted that the surface epithelium is little changed but beneath it there are masses of cells and new blood vessels. The tissue of the cornea appears to be separated into layers by rows of cells or a richly cellular exudate. The cells are lymphocytes or large mononuclear cells and in many of these, especially in the anterior parts of the cornea, leishmania occur. Descemet's membrane is thickened and irregular on account of the presence of round and large cells containing parasites. In no part were polynuclear cells present, so that the authors think that they are justified in attributing this interstitial keratitis to the actual presence of the parasites. In long standing infection there is a tendency for the exudate to absorb and to be replaced by fibrous tissue.

C. M. W.

YAKIMOFF (V. L.) & SCHOKHOR (N. I.). i. **Recherches sur les Maladies Tropicales Humaines et Animales au Turkestan. (1) Répartition de la Leishmaniose canine au Turkestan.**—*Bull. Soc. Path. Exot.* 1914. Mar. Vol. 7. No. 3. p. 185.

ii. **Recherches sur les Maladies Tropicales Humaines et Animales au Turkestan. (2) La Leishmaniose cutanée (Bouton d'Orient) spontanée du Chien au Turkestan.**—*Ibid.* pp. 186-187. With 1 text fig

i. Between April and September 1913 the authors examined 647 dogs in Turkestan and found that 157 (24·26 per cent.) were infected with leishmania (canine kala azar). The distribution of the disease in dogs in the district is shown in the following table :—

Locality.	No. of Dogs Examined.	No. of Dogs Infected.	Percentage of Infection.
Taschkent	326	94	28·8
Village Toy-Tubé ..	8	4	28·8
Boukhara	107	27	25·2
Merv	40	1	2·5
Kouchka	17	4	23·5
Askhabade	100	7	7
Samarkande	49	20	40·8

[Besides they have encountered 31 cases of human kala azar (27 in children and 4 in adults).]

ii. The authors remark that NELIGAN was the first to show, by the discovery of leishmania in the sores, that dogs in Persia were liable to oriental sore. The present paper records the discovery of the disease in dogs in Tashkent. Some of the parasites in the lesions are so large ($7{\cdot}85\mu \times 2{\cdot}35\mu$) that the authors think it a distinct variety and name it *Leishmania tropica* var. *canina*. In the human disease they have two varieties according to size, *Leishmania tropica* var. *minor* (Bukhara) (size $3{\cdot}92 \times 3{\cdot}14\mu$) and *Leishmania tropica* var. *major* (Termese) (size $5{\cdot}49 \times 3{\cdot}92\mu$).

C. M. W.

PEDROSA (Alex. M.). **Leishmaniose local do Cão. Local Leishmaniasis of Dog.**—*Annaes Paulistas de Medicina e Cirurgia.* 1913. Sept. Vol. 1. No. 2. pp. 33-39. With 1 plate.

This paper was read before the Medical and Surgical Society of S. Paulo in July and August 1912. The opening up of the north-west region of Brazil by railway resulted in numerous cases of dermal leishmaniasis. The disease was contracted in that part where the work was carried through the virgin forest on the left bank of the Tieté River. Travelling through this country in July 1912 the author came across one dog with an ulcerative condition of the nose, which appeared as if it might be a leishmaniasis. Unfortunately this dog was not examined microscopically. A second dog from Itapura Velha came under the author's notice. In this village only one case of leishmaniasis in man could be found, a case of five years' standing with only the nose and throat involved. The dog when seen was in very poor condition and, in addition to superficial ulcers on the body, had at the inferior and internal border of the left nostril an ulcer with regular hard cut edge and even base. Smears from this sore revealed numerous leishmania indistinguishable from those obtained from human cases. The dog died and examination of the internal organs for leishmania gave only negative result.

The author believes that the first dog seen by him was also a case of the disease, especially as this dog's master had an ulcer on the foot which had been diagnosed a dermal leishmaniasis. He was following a popular belief in allowing his dog to lick the sore on his foot, and it was during the course of this treatment that his dog developed the ulceration of the nose. It was probably a case of direct infection.

C. M. W.

TROPICAL SORE.

CHATTON (Edouard). **Le Bouton d'Orient (Clou de Gafsa) dans le Djerid. Ses Relations avec le Facies rupestre du Sol.**—*Bull. Soc. Path. Exot.* 1914. Jan. Vol. 7. No. 1. pp. 30-35. With a map.

This paper contains an account of investigations into the conditions which are associated with the distribution of oriental sore in the Djerid district of Tunis. The disease is scattered irregularly through the region and only one condition appears necessary to its occurrence, the existence of a rocky soil within one or two kilometres of a human population. This rocky soil shelters a fauna peculiar to itself and herein may be found not only the insect carrier but possibly also some vertebrate reservoir of the virus.

C. M. W.

FOLEY (H.), VIALATTE (C.) & ADDE (R.). **Existence dans le Sud-Marocain (Haut-Guir) du Bouton d'Orient à l'Etat endémique.**—*Bull. Soc. Path. Exot.* 1914. Feb. Vol. 7. No. 2. pp. 114-115.

In North Africa the only centres in which oriental sore is endemic are Gafsa in Tunis and Biskra in Algeria. Isolated cases have been described by GROS in the valley of the Sebaon (Kabylie) and by CAMBILLET near Ténès. That the disease occurred in Morocco has been suspected for some time but the proof has not been forthcoming. In this paper the authors report the discovery of the disease with the finding of *Leishmania tropica* at Bou-Anan, longitude 6° West, latitude 32° North (South Morocco). This endemic centre appears to be separated from that of Biskra by a district long known to medical officers who have not reported in it a single case of oriental sore.

C. M. W.

JEANSELME (E.). i. **Leishmaniose cutanée à Foyers multiples et à Marche extensive très améliorée par le Salvarsan et le Néosalvarsan.**—*Bull. Soc. Path. Exot.* 1914. Jan. Vol. 7. No. 1. pp. 36-41.

ii. **Bouton d'Orient à Foyers multiples et à Tendance extensive très amélioré par le Traitement d'Ehrlich.**—*Bull. de la Soc. Française de Dermatol. et Syph.* 1914. Jan. Vol. 25. No. 1. pp. 4-10.

These two papers contain accounts of a case of oriental sore contracted in the oasis of Southern Algeria. There were multiple lesions distributed on various parts of the body. The following injections were commenced two months after the appearance of the first sore :—

Dec. 22	intravenously	0·45 cg.	of neosalvarsan.
,, 26	,,	0·60 cg.	,,
,, 31	,,	0·75 cg.	,,
Jan. 6	,,	0·30 cg.	of salvarsan.
,, 10	,,	0·40 cg.	,,

The neosalvarsan had no very marked effect on the sores. The salvarsan however caused them to dry and at the time of writing there was distinct improvement, though the scabs were not yet completely detached. During the treatment no degenerative change was noted in the leishmania from the sores, though they gradually decreased in number.

C. M. W.

WAGON (P.). **Un Deuxième Cas de Leishmaniose cutanée observé au Dahomey et traité par l'Arsénobenzol Billon en Lavements.**—*Bull. Soc. Path. Exot.* 1914. Jan. Vol. 7. No. 1. pp. 46-48.

The author records the case of a sergeant (the second case noted by him) who contracted cutaneous leishmaniasis while travelling in Dahomey in the Niger district. There were three sores on the right arm and in scrapings from these characteristic leishmania were found. He received an enema of ·60 gram of arsenobenzol dissolved in boiled water cleared by means of normal soda solution. At the same time 20 drops of tincture of opium were given by the mouth. There was some reaction in the form of intestinal colic. A week later

the treatment was repeated. The result was most definite, so that by the tenth day the lesions were well on the way towards healing and a fortnight later had quite disappeared.

C. M. W.

GIUGNI (Francesco). **Note Ematologiche su 4 Casi di Leishmaniosi Esterna (Bottone d'Oriente).**—*Malaria e Malat. d. Paesi Caldi.* 1914. Mar.-Apr. Vol. 5. No. 2. pp. 98-105. With 1 fig.

This paper records the results of an examination of the blood in four cases of oriental sore in Italy with a view to determining the leucocyte formula. In two cases blood taken from the periphery of the lesions was found to contain percentages of 69·2 and 61 of mononuclear leucocytes of various sizes. The finger blood of the four cases likewise showed a mononuclear increase, which was however not so large as that shown by the blood taken from near the lesions.

C. M. W.

BARBARA (Mario). **Nuovo Caso di Leishmaniosi Cutanea a Forma Molteplice.**—*Malaria e. Malat. d. Paesi Caldi.* 1914. Mar.-Apr. Vol. 5. No. 2. pp. 91-97. With 1 fig.; and *Ann. d. Med. Navale e Colon.* 1914. Feb.-Mar. Anno 20. Vol. 1. No. 2-3. pp. 161-169.

A case of oriental sore in a girl aged 15 years from Caltavuturo in Sicily. There were two sores present on the right side of the face. The author failed to obtain cultures of the leishmania though these were found in smears of the sores.

C. M. W.

HUNTEMÜLLER. **Neuartige Parasitenbefunde bei der Jerichobeule.** [A Seemingly New Parasite found in the Jericho Boil.]—*Centralbl. f. Bakt.* 1. Abt. Orig. 1914. Feb. 25. Vol.73. No. 2. pp. 137-141. With 3 plates and 1 text fig.

The author has been able to study in Jerusalem the material from three cases of Jericho boil, a disease which is clinically identical with oriental sore and has hitherto been supposed to be of this nature. In only one case was he able himself to obtain material directly from the sores. The two other cases were not actually seen by him, but he was able to examine material already fixed in sublimate or formalin. The first case was examined in the following way. Exudation from the sores was stained but revealed only bacterial infection. A portion of one was excised and smears from the cut surface were fixed while moist in sublimate alcohol and the tissue itself was fixed in the same fluid. In none of these were parasites found. In sections of the tissues from one of the other cases there were distributed in the large mononuclear cells bodies which owing to their distribution appeared to be leishmania. The large cells were often packed with them. On careful examination however the two nuclei characteristic of the leishmania could not be detected, while the bodies appeared distinctly smaller than the leishmania, having a diameter at most of about ·8μ. They were round or oval in shape and had each a single nuclear mass. On this account the author is led to believe that the bodies are organisms distinct from the leishmania and he suggests for them

the name *Plasmosoma jerichoense* and believes them to be the cause of the disease. [Perhaps it may be remarked here that it is notoriously difficult to make out details of the structure of leishmania in sections of fixed material. For some reason or another in such material actual leishmania often appear very much smaller than normal while only one of the two nuclei is visible. This may be the result of shrinkage in fixation. In the plates illustrating the sections of Jericho boil the author shows his parasite in the large mononuclear cells and here they appear exactly as leishmania so often do in similar sections, shrunken and with only one nucleus visible. It seems to the reviewer that the author may be dealing with such altered leishmania. It is unfortunate that the parasites were only seen in these sections and have not been examined in ordinary dried smears stained by Romanowsky stain, a method which reveals the characteristic structure of the leishmania so much better than the methods employed by the author.]

Not only is the clinical history of Jericho boil identical with that of oriental sore but the histological findings in sections of the sores correspond also, so that the author himself admits that apart from a difference in the parasite the two diseases are almost indistinguishable.

C. M. W.

Row (R.). **Generalised Leishmaniasis induced in a Mouse with the Culture of *Leishmania tropica* of Oriental Sore.**—*Bull. Soc. Path. Exot.* 1914. Apr. Vol. 7. No. 4. pp. 272-277.

Nicolle and Manceaux were the first to show that oriental sore could be induced in monkeys by the injection of cultures of *Leishmania tropica* of North Africa. Laveran later showed that this was true also of cultures of *L. tropica* of India. In 1913 Gonder published interesting results of experiments with cultures of *L. tropica*, whereby he had been able to produce in mice generalised infection with leishmania by their injection intraperitoneally. The culture used by Gonder was of the North African variety of *L. tropica*. Row in this paper states that he has likewise obtained a general infection in a mouse by the injection of cultures of *L. tropica* from oriental sore of Cambay, India. The type of infection produced and the post mortem appearances are identical with those produced by the injection of *Leishmania donovani* of kala azar. The author has previously shown that a local lesion can be produced by the subcutaneous injection of *L. donovani* so that he is led to state "that no matter what parasite (*Leishmania donovani* or *Leishmania tropica*) one deals with, it is possible to induce even with cultures a localised nodule or a generalised infection in both." Between the observations of Gonder and the author of the paper under review there are certain differences. Gonder noted that the mice in which he produced the generalised infection with *L. tropica* eventually developed cutaneous lesions in which the leishmania occurred. With injections of *L. donovani* no such lesions developed (this *Bulletin*, vol. 2, p. 449). Row has not seen cutaneous lesions in any of his infected mice.

Remarking on these experiments Laveran points out that they raise the whole question of the relationship of the two parasites of kala azar and oriental sore, an enquiry into which was first suggested by Sir Patrick Manson in 1907.

C. M. W.

i. GAUCHER & BLOCH (Maurice). **Bouton de Biskra et Réaction de Wassermann.**—*Bull. de la Soc. Française de Dermatol. et Syph.* 1914. Jan. Vol. 25. No. 1. pp. 2-4.

ii. JEANSELME (E.). **Bouton d'Orient à Foyers multiples et à Tendance extensive, très amélioré par le Traitement d'Ehrlich.**—*Ibid.* pp. 4-10.

The first authors reported to the Society a case of oriental sore which gave a positive Wassermann reaction. Jeanselme on the other hand reported a case (see above, p. 558) which had multiple sores on the face and limbs with some involvement of the lymphatic system, in which there was a negative Wassermann reaction. This case was treated with neosalvarsan intravenously with good results.

C. M. W.

MCEWEN (Ernest L.). **Oriental Sore in the Americas, with Report of a Case.**—*Jl. of Cutaneous Diseases incl. Syphilis.* 1914. Apr. Vol. 32. No. 4. [Whole No. 379.] pp. 275-286. With 1 plate.

This paper contains an interesting review of the history of the discovery of dermal leishmaniasis in South America. A case is described of a man who contracted a sore on the ear while travelling between Pacasmayo, Peru, and the Upper Amazon. The diagnosis was not made till after the patient had returned to Chicago. In scrapings from the ulcer, which was of the eroding type on the margin of the ear, there was found in addition to the leishmania a diplococcus which resembled the gonococcus in shape and size but was however Gram-positive. The author points out that diplococci of this type were first noted by WENYON in oriental sore in Bagdad and then by SEIDELIN in this disease in Mexico.

C. M. W.

CARINI (A.). **L'Emétique dans le Traitement de la Leishmaniose cutanée et muqueuse.**—*Bull. Soc. Path. Exot.* 1914. Apr. Vol. 7. No. 4. pp. 277-281.

It is pointed out that cutaneous leishmaniasis in South America is comparatively harmless, provided the disease does not extend to the mouth and nose, but that when it does so the condition induced is most serious. On this account it is most important to discover some efficacious line of treatment. The author, encouraged by some good results communicated by VIANNA to the Brazilian Congress of Medicine, has been experimenting with tartar emetic in powder form. He has used it in a one per cent. solution in distilled water (not in physiological saline as usually advocated). The solution is sterilised in the cold by filtration, and injections of five to ten cc. of the solution have been made intravenously either every day or on alternate days according to the tolerance of the patient. Care has to be taken that the solution does not escape into the tissue surrounding the vein, in which case much pain results. Injected slowly into the vein there is no ill effect save occasionally a slight tendency to cough for a few minutes. Some hours after the injection, however, there may be muscular or articular pains of varying intensity.

The author gives the history of several cases which illustrate the successful nature of this treatment.

In *Case* 1 there were three sores on the face. Between December 15th and January 19th there were given 27 injections. By this time recovery was complete, the sores having entirely disappeared.

Case 2 was one in which the nose, mouth and pharynx were extensively involved. Forty injections (in which 3·55 grams of tartar emetic were given) sufficed to bring about a complete cure. The mucous membranes, which before were swollen and extensively ulcerated, returned to their normal condition.

Case 3 was again one of cutaneous and mucosal disease. Between November 22nd and December 24th six injections were given. Such great improvement had resulted that the patient discontinued treatment and returned to his home.

Finally there is mentioned a case in which the patient was in such a pitiable condition that all hope of his recovery had been abandoned. After several weeks of treatment the improvement was so marked that the author is led to describe it as a veritable resurrection. The author mentions the fact that Oscar d'Utra e Silva has also obtained very good results with this line of treatment. Lindenberg has employed with good result trixidine (emulsion in oil to forty per cent. of trioxide of antimony), recommended by Kolle as being active against trypanosomes. The author considers it definitely proved that antimony is a very active medicament in cutaneous leishmaniasis.

C. M. W.

Gorga (José). **Leishmaniose das Mucosas.**—*Revista Med. de S. Paulo.* 1914. Feb. 15. Vol. 17. No. 3. pp. 35-40. With 3 figs.

Cases of dermal leishmaniasis with extensive involvement of the nose and mouth have come under the author's notice in North East Brazil and, in presenting these photographs showing the appalling conditions which may result from the disease, he reviews briefly the history of dermal leishmaniasis in South America.

C. M. W.

Guerreiro (Cezar). **Da Reacção de Bordet e Gengou na Leishmaniose (Nota preliminar).**—*Brazil Medico.* 1914. Jan. 8. Vol. 28. No. 2. pp. 11-12.

This is a preliminary report of observations made by the author in the Oswaldo Cruz Institute on three cases of dermal leishmaniasis in reference to the reaction of Bordet-Gengou. As antigen the flagellates in cultures of leishmania were used after separation by centrifugation and cytolysis in distilled water. The reaction was definitely positive in the three cases, which all gave a negative Wassermann reaction. There was no evidence of a previous syphilitic infection in any of the cases.

C. M. W.

TYPHUS.

SERGENT (Edm.), FOLEY (H.) & VIALATTE (Ch.). **Transmission à l'Homme et au Singe du Typhus exanthématique par les Poux d'un Malade atteint de Fièvre récurrente et par des Lentes et Poux issus des Précédents.** [Transmission of Typhus from Man to Monkey by Lice obtained from a Relapsing Fever Patient and by the Eggs and Lice bred from them.]—*Compt. Rend. Acad. Sciences.* 1914. Mar. 30. Vol. 158. No. 13. pp. 964-965.

It is well known that epidemics of relapsing fever are often accompanied by cases of typhus and, since both are transmitted by the same carrier, namely the louse, this association is to be expected.

The authors were experimenting on the mechanism of the transmission of relapsing fever by lice, and for this purpose collected these insects from a patient suffering from this disease and subsequently made experiments with them on normal individuals. In four cases the subjects became infected from these lice, not with relapsing fever, but with typhus. The experiments were as follows :—

Lice and eggs were collected from a patient 11 days after the finish of a typical attack of relapsing fever, during which spirochaetes were present in the blood for six days. A large number of the adult lice in this lot showed numerous spirochaetes in their bodies.

Experiment 1. About 200 of these lice, collected from the patient on December 11th, were fed daily on a human subject, who became infected with typhus on December 25th.

Experiment 2. Another subject, on December 11th, was inoculated subcutaneously with the contents of 10 young lice collected off the above-mentioned patient. On December 19th, eight days later, he became infected with typhus.

Experiment 3. 55 eggs collected from the same patient on December 11th were crushed in saline solution and the resulting liquid placed on the slightly scarified surface of another subject. On December 16th, five days later, the latter became infected with typhus.

In addition, one of the authors, who looked after these three patients, became infected with the same disease. In all four cases the duration of the fever was 13 to 15 days.

Two monkeys were also infected with typhus by inoculating them, one subcutaneously and the other intraperitoneally, with the body contents of lice, collected from the patient of Experiment 1, on January 14th, six days after he had recovered from the attack. One became infected after four days and showed a high temperature for seven days, whilst in the other the incubation period was only three days and the monkey died on the 19th day. In addition another monkey was infected by the inoculation of blood from the former of these animals.

These experiments admit of the following conclusions :—

(1) Typhus can be transmitted from man to man by the bites alone of infected adult lice.

(2) Lice taken from a man infected in this way can in turn transmit the infection to monkeys, by subcutaneous or intraperitoneal inoculations. The passage to another monkey can be realised by the inoculation of blood from a monkey thus infected.

(3) The infection is hereditary in the louse ; the eggs laid by infected lice are also capable of producing the infection.

[These observations are very important. NICOLLE, BLAIZOT and

CONSEIL observed hereditary infection in lice infected with relapsing fever (see this *Bulletin*. Vol. 1. p. 32), but as a result of subsequent experiments concluded that it was very exceptional.]

E. Hindle.

DAY (L. C.). **Typhus Fever in New Mexico. A Reported Outbreak among the Navajo Indians.** –*U.S. Public Health Rep.* 1914. May 1. Vol. 29. No. 18. p. 1068.

A record of a recent epidemic of typhus among the Navajo Indians, at Canoncito Cojo, about 40 miles west of Albuquerque, New Mexico. The total number of cases was 27—11 adults and 16 children—and there were four deaths (2 children and 2 adults). As a rule the children suffered less severely than the adults, though nearly all the patients were seriously ill for a short time at least, and all had a very marked eruption.

The first source of the infection was an old Mexico Indian who seemed ill on a visit to the camp about two weeks before the first case. The epidemic was arrested by placing all the people in quarantine who had been exposed to the contagion or were then sick, and by eradicating all lice from these persons and destroying or sterilising all fomites.

E. H.

FRAENKEL (Eugen). **Ueber Fleckfieber und Roseola.** [Typhus and Roseola].—*München Med. Wochenschr.* 1914. Jan. 13. Vol. 61. No. 2. pp. 57-60. With 7 text figs.

In this paper the author discusses the histology of the cutaneous eruption in the case of typhus and typhoid respectively. The nature of the inflammation was found to be quite different in the two cases. In typhoid the small vessels of the skin become blocked up by bacilli and thus a thrombosis is produced, and the inflammation is a result of the engorgement and swelling of the vessels. In the case of typhus however there is no thrombosis, but the endothelium and elastic layers of the arterial walls are affected and a nodus is produced which is filled with an infiltration of lymphocytes.

[It might be mentioned, however, that the author has only examined preparations from two cases of typhus and, therefore, until more material has been examined, his results are open to criticism.]

E. H.

MARKL. **Flecktyphus auf Schiffen.** [Typhus in Ships].—*Arch. f. Schiffs- u. Trop. Hyg.* 1913. Dec. Vol. 17. No. 23. pp. 805-809.

The author remarks that typhus is now an extremely rare disease on board ship and, in ten years' experience, he only came across one example of an outbreak, which occurred on a Greek steamer at Trieste. The expression "ship-typhus," that used to be applied to the disease, is therefore no longer applicable. During the past year, however, numerous outbreaks of typhus occurred on board the Lloyd Transport steamers, conveying refugees and wounded from the Balkans, and the author observed several cases in Trieste. The occurrence of the outbreaks agreed with the view that lice were responsible for the transmission. Markl then proceeds to add some notes on the symptoms of the disease.

Several attempts were made to culture organisms from the blood of typhus patients, but only negative results were obtained. On the other hand the polymorphonuclears containing red granules described by PROWAZEK (see this *Bulletin*, Vol. 2, p. 640) were observed in the blood, but their significance could not be determined.

Employing as antigen an alcoholic extract of the organs from a typhus body, a slight but distinct deviation of the complement was observed when the serum of typhus patients was compared with that of normal persons.

E. H.

OUFTUGEANINOFF (M.). **Le Traitement du Typhus "Exanthematicus" par l'Iode.**—*Presse Méd.* 1914. Jan. 28. No. 8. pp. 78-79.

In 1909 JAVOROWSKY published some interesting observations on the treatment of typhus by iodine. The author has employed the same medicament in the treatment of a number of cases of typhus, which came under his observation during 1912 and the beginning of 1913 at the hospital of Ekaterinodar (South Russia). In all 201 typhus patients entered the hospital during this period and of these 106 were treated with iodine, whilst the remainder were not given any of this substance. The percentage mortality was as follows :—

	No. of patients.	Dead.	Percentage mortality.
Total number of patients..	201	21	9·57
Treated with iodine ..	106	7	6·6
Without iodine	95	14	14.7

From these results it is evident that the administration of iodine has a decided effect on the mortality of the disease, and in addition the author states that this substance considerably mitigates the severity of the symptoms, such as the eruption and delirium.

The author administered the iodine mixed with milk or in the form of a potion, but he does not state what doses were employed.

E. H.

IOUDINE. **Le Typhus exanthématique dans les Mines de l'Arrondissement d'Iekaterinbourg.**—*Vestnik Obstchestvennoï Guiguieny.* 1913. Aug. p. 1275. (from a review in *Bull. de l'Office Intern. d'Hyg. Publique.* 1914. Feb. Vol. 6. No. 2. p. 360.)

During this epidemic there were 332 cases of typhus in eighteen months, and at the same time 145 cases of relapsing fever and 71 cases of typhoid were also recorded. In this region the movements of the population are very considerable and therefore it was essential that the habitations should be thoroughly disinfected. The most efficient disinfectant was found to be the following :—

Phenol (crystals)	1 part.
Naphthalene	1 ,,
Petrol	9 parts.
Russian turpentine	9 ,,

This liquid not only kills any insects that may be in the houses (bugs, fleas, etc.) but also their eggs. Wooden floors and any planks that serve as bedsteads should be sprinkled with the mixture at least twice

a month and, in addition, lodgings or similar places should be thoroughly disinfected from top to bottom every two months.

In addition free baths were placed at the disposal of the workers. For the disinfection of their clothes and house linen the author recommends the apparatus "Helios," the principle of which is very simple, so that it can easily be constructed in any desired locality.

E. H.

GOLDBERGER (Joseph). **Typhus Fever. A Brief Note on its Prevention.**—*U.S. Public Health Rep.* 1914. May 1. Vol. 29. No. 18. pp. 1068-1073.

The author again calls attention to the fact that typhus is endemic in several of the large American cities and in addition may be introduced from abroad. Thus, since November 19th, 1913, at least 19 cases have been discovered in immigrants arriving at Atlantic ports from Europe. Seven of these arrived at Providence from Marseilles and Naples, and 12 at the New York quarantine, mainly from southern European ports.

After a brief review of the symptoms and methods of transmission of the disease the author adds a few notes on its prevention. Community prophylaxis is probably easier and more effective in protecting the individual than the individual's own effort to guard himself, for in many parts it is almost impossible to avoid coming in contact with persons harbouring lice. When possible, public bath houses and wash houses, where the poor may bathe and do their washing at a minimum or without cost, should be provided, and troops in the field should be given the opportunity as frequently as possible to wash and scald or boil their body linen. Lodging houses, cheap boarding houses, night shelters, hospitals, jails and prisons, frequently constitute foci of the disease and should receive rigid sanitary supervision, including the enforcement of measures to free from lice all inmates of such institutions on admission.

With regard to individual foci, these should be dealt with by segregating and keeping under observation all exposed individuals for 14 days—the period of incubation—from the last exposure; by disinfecting (boiling or steam) the suspected bedding, body linen and clothes, for the destruction of any possible vermin that they may harbour; and by fumigating (with sulphur) the quarters that may have been occupied. The patient should be removed to "clean" surroundings, being very careful that he does not take with him any vermin. In the case of better class families it is reasonably safe to allow the patient to remain in his own home if this is quite free from vermin, and similarly the sulphur fumigation is unnecessary in this class of cases.

E. H.

Book Reviews.

Crawfurd (Raymond). **Plague and Pestilence in Literature and Art.** —222 pp. With 31 plates. 1914. Oxford : The Clarendon Press. [12*s*. 6*d*. net.]

This excellently illustrated volume, evidently the product of much research, reproduces the FitzPatrick Lectures delivered by the author before the Royal College of Physicians of London in 1912.

Pestilence in every form was regarded by our ancestors as the manifestation of the wrath of a deity, the Hebrew religion being no more advanced in this respect than the polytheism of Ancient Greece and Rome. Dr. Crawfurd takes his reader with him through the long catalogue of outbreaks of this kind which are recorded in European literature and art, down to the end of the 18th century, and certainly the array of human fatuity and impotence here revealed is calculated to make the practitioner of medicine thankful that his lot was not cast in an earlier age than the present one. Yet who shall say whether the chapter of folly is yet closed ? One of the most important sections of the book is that in which Dr. Crawfurd delivers the verdict of an expert upon the plague of Athens recorded by Thucydides, which non-medical historians generally compare to the well-known plague of London ; but Dr. Crawfurd is of opinion that the epidemic recorded by Thucydides was one of spotted typhus, of the kind that dogs the footsteps of an army, and finds a congenial soil in the conditions of a beleaguered city. The reasons which the author offers for this opinion must be sought for in the text, and will probably command professional approval.

Contemporary art can depict the mental attitude of our ancestors towards these fearful outbursts of epidemic disease far more effectively than any words of a writer ; and so Dr. Crawfurd has been most liberal to his readers in the matter of illustration. The horrors of plague have perhaps never been more effectively put on canvas than in the picture by Micco Spadara, representing the plague of Naples in 1656 (Plate xxvi) and that by De Troy, of the outbreak at Marseilles in 1720 (Plate xxx). The physical difficulty of getting the dead buried under these awful conditions perhaps strikes the expert more forcibly than anything else.

The author of this work, we think, deserves the congratulations of his professional brethren upon a contribution to general literature which cannot fail to have a permanent value. Dr. Crawfurd's style is so simple and free from technicalities that the non-medical reader will be able to peruse the book with ease ; and we should anticipate for it a ready sale.

J. B. Nias.

Schilling-Torgau (V.). **Ausgewandte Blutlehre für die Tropenkrankheiten.** [Monograph on Tropical Haematology.]—Mense *Handbuch der Tropenkrankheiten.* 2nd Edit. Vol. 2. pp. 1–170. 1914. Leipzig: Verlag von J. A. Barth.

This monograph deals with tropical haematology, not only in its application to tropical medicine, but also to the whole of our modern knowledge of this important subject. There is no branch of modern temperate, as opposed to tropical, medicine on which more light has been shed by recent discoveries than the study of the blood. Dr. Schilling is therefore not only to be congratulated on having embarked on this ambitious project, but on the success he has achieved in presenting his subject in such a well ordered form.

The first part of the 170 pages which the monograph contains is devoted to the methods of collecting blood for examination and of making and staining films. Considerable attention is directed to Ross's thick film method, which the author is inclined to recommend for rougher and more rapid diagnosis ; for finer work he considers the destruction of the blood elements too great. The necessity for drying these films slowly for at

least half an hour in the incubator is insisted on. In fixing films Schilling does not recommend any of the wet methods. The neutral Giemsa stain (5 drops to 5 cc. neutral distilled water) finds favour as the most suitable for all kinds of blood work. Films should be stained for twenty minutes, but if insufficiently stained fresh solution can be added. Laboratory workers will find this section particularly useful; in it all available stains and their utility in blood work are discussed in detail. Considerable attention is devoted to a description of the author's apparatus for representing the differential leucocytic counts of value in diagnosis, by columns of variously coloured beads. No less than ten pages are devoted to a description of the erythrocyte, its development, regenerative and degenerative forms.

He classifies the anaemic blood picture somewhat elaborately as follows:–

(*a*) *The non-regenerative red blood picture* as found in

(1) Slight anaemia, accompanied by a loss of cells and haemoglobin.

(2) A regenerative anaemia with oligocythaemia, i.e., a chronic aplastic anaemia in which regeneration is prevented by a long continued toxic absorption and is characterised by severe loss of cells and of haemoglobin; or as a pure degenerative anaemia found also in cases of profound toxic absorption and characterised by poikilocytosis, microanisocytosis, reduction of haemoglobin content and number of red blood cells; colour index under ·5; or as a hyperchromatic-aplastic anaemia characterised by a low blood count, anisocytosis and an increase in the colour index.

(*b*) *The polychromatic red blood picture.*

(1) Purely regenerative, characterised by polychromasia, macrocytosis, temporary diminution of red cells, haemoglobin content raised.

(2) With degenerative enclosures, characterised by basophile granulations, anisocytosis, poikilocytosis, medium red cell count: colour index raised.

(*c*) *The normoblastic red blood picture.*

(1) Purely regenerative, characterised by polychromasia and macrocytosis, variable number of normoblasts, erythroblasts undergoing mitosis, polychromatic macro-normoblasts; diminution of red cell count below 3,000,000, rapidly rising to normal; haemoglobin index raised.

(2) With degenerative enclosures, characterised by small normoblasts, microblasts, nuclear remains, basophilic forms and macroblasts, anisocytosis, poikilocytosis etc. Red cell count low or progressively diminishing Haemoglobin percentage less than normal.

(*d*) *The megaloblastic red blood picture*, characterised always by toxic degenerative enclosures; a few megaloblasts and megalocytes, marked anisocytosis, poikilocytosis and schizocytosis; regenerative stages marked by polychromasia, basophilic granules; red cell count and haemoglobin percentage always diminished, the former often under one and a half millions; on the other hand the colour index is often above 1 (Hyperchromasia).

All these types of blood picture may present themselves in any diseased condition marked by blood destruction and depend solely upon the degree of anaemia produced in different diseases. The blood picture becomes of importance only when taken in conjunction with other symptoms and then only can it be regarded as of diagnostic value. The types of leucocytes and their significance are also classified in considerable detail as follows:—

1. Granulocytes			
(*a*) with basophilic	granulations	·5 %	in normal blood.
(*b*) with eosinophilic	granulations	3 %	in normal blood.
(*c*) with neutrophilic	granulations	60–70 %	in normal blood.
2. Lymphocytes (always hyaline) possibly capable of subdivision into		30 %	,,
(*a*) small and medium sized.			
(*b*) large and immature lymphocytes.			

3. Large mononuclears and transitional cells (with azurophilic granules) 6 per cent. in normal blood.

The thoroughness of the work and elaboration of detail may be judged from the number of pages (18) devoted to a consideration of the blood changes in malaria and blackwater fever.

One is surprised to note that considerable space is devoted to the subject of lateral displacement of the leucocytic nucleus to the left as a sign of blood regeneration in malaria and blackwater fever, which Schilling believes to be a sign of considerable prognostic significance.

The blood changes in trypanosomiasis are summed up as follows:

(1) a progressive anaemia with slight attemps at regeneration; (2) during the acute phase a neutrophile excess with nuclear displacement; (3) a mononuclear increase commensurate with a diminution in the number of trypanosomes; (4) small and medium sized lymphocytes relatively and actually increased; (5) the eosinophiles reduced as in all other intoxications, but after the cessation of symptoms reappearing in numbers. The blood changes in schizotrypanosomiasis (*S. cruzi*)—a well marked lymphocytosis with a relatively low mononuclear increase—are of interest, as we do not remember to have seen them quoted before.

Leishmaniasis is considered under the headings of Kala azar, Infantile leishmaniasis and Oriental sore. The blood count of uncomplicated amoebiasis shows little of interest, though a good deal of attention is directed to the well-known polymorphonuclear leucocytosis in liver abscess. Under yellow fever Schilling again brings forward weighty arguments against the validity of SEIDELIN'S *Paraplasma flavigenum.* These bodies he believes to be identical with the nuclear remains so often encountered in the erythrocytes in severe anaemia; especially since similar bodies are also found in young guinea-pigs, a circumstance which renders the proof of alleged communication of yellow fever to these animals, founded on the presence of these bodies in the erythrocytes after an inoculation wit yellow fever blood, of doubtful value.

The four diseases, yellow fever, dengue, pappataci fever and seven day fever, apparently in so many ways closely allied, are characterised by a leucopenia and a relative mononuclear increase, facts supporting the hypothesis of an infection with an ultramicroscopic germ. Though as yet scarcely sufficient study has been devoted to verruga peruana, the blood changes appear to be of the most anomalous nature, the exact significance of which still awaits elucidation. The degenerative changes in the red cells are of the most pronounced character; the refractile structures in the centre of the erythrocytes resemble small paranuclear bodies in the megaloblasts of the bone marrow of young guinea-pigs. The so-called *Anaplasmata* of GALLI-VALERIO Schilling would relegate to the group of marginal degenerations of the red cell (Randkörnchen).

In smallpox Schilling summarises the typical blood picture as specific and as the result of stimulation of the whole blood system, resulting in a myelocytosis with development of small mononuclear cells.

It cannot be said that the blood picture in beri-beri shows any particular features. In sprue on the other hand the anaemia is protean and may resemble in almost every detail that of pernicious anaemia. In the early stages the anaemia is of the aplastic type (up to and above 60 per cent. haemoglobin). Schilling, as a result of his own observations, concludes there is a leucopenia and a displacement of the leucocytic nuclei to the right, an observation he considers of some importance. He concludes that the blood picture undoubtedly hall-marks sprue as an intestinal toxaemia.

In undulant fever the blood picture is on the whole that of a chronic septicaemia, but differs slightly in the differential leucocyte count. In leprosy and relapsing fever it is of small value.

Fourteen pages are devoted to a consideration of helminthiasis and especially of the diagnostic and prognostic value of eosinophilia. In ankylostomiasis the changes in the red cells indicate absorption of some toxic product and contraindicate the view of an anaemia caused by actual absorption of blood by the parasite. In bilharziasis of all species the eosinophilia is generally above 30 per cent. In filariasis the blood changes are considered to be a cardinal sign, seeing that an eosinophilia may be the only sign of infection in the absence of either periodic or non-periodic microfilariae.

Three very excellent blood plates, the most artistic and definite we remember to have seen, and an exhaustive list of the literature, occupying 21 pages, conclude the monograph.

Though many of the blood changes in different tropical diseases are only of doubtful value and significance, it is advantageous to find a description of them in such elaborate detail and in the compass of one volume. Much more work is required before we can hope to obtain an idea of the "pure blood picture" of different tropical diseases, as for instance beriberi or leprosy in natives who are invariably infected with some form of helminthiasis. Great care should be exercised in quoting results of workers whose statistics are of doubtful value.

The ponderous phraseology of the German language does not lend itself to an attractive setting forth of such a technical subject and consequently some of the descriptions appear at first sight rather involved.

P. H. Bahr.

LUDLOW (C. S.). **Disease-Bearing Mosquitoes of North and Central America, the West Indies, and the Philippine Islands.**—*U. S. Army War Dept., Office of the Surgeon General. Bulletin* No. 4. 1914. Nov. 96 pp. With 27 plates and 29 figs.

This little compilation consists mainly of descriptions—for the most part in considerable detail—of about thirty species of Anopheles known to exist in the regions indicated in the title, and of a few notorious Culicini, to wit, *Culex fatigans*, *Stegomyia fasciata*, and two species of *Mansonia*. It also contains some preliminary remarks upon the classification of mosquitoes, some general notes upon their breeding-places and life-history, some instructions for collectors, and—as is duly acknowledged in a footnote—some long extracts from STEPHENS's paper in the *Bulletin of Entomological Research* for 1911 (vol. 2, p. 1) on "Methods for detecting Sporozoits and Zygotes in Mosquitoes infected with Malaria."

As the book is stated in the official preface to be intended for the instruction of medical officers, it is a pity that the descriptions of species are so long and so lacking in distinction and point. There is no doubt that short critical diagnoses, in which the salient specific features are emphasised, are much more telling and much less likely to be misleading than tedious descriptions in which characters common to many species are again and again repeated. It would also have been more convenient if the species had been arranged geographically.

It is doubtful whether the medical officer, whose work is a long exercise in the exact observation of physical signs and symptoms, and of their classification according to the sum of their agreements and differences, will find much inspiration in the remarks upon classification, which is a logical, not an arbitrary, process whether one is dealing with mosquitoes or with other things.

A. Alcock.

ERRATUM.

Dr. Robert LESK (Weltevreden) points out that in the review of his paper published in this *Bulletin*, Vol. 3, p. 69, the expression "gave a vague history of having had dysentery some months before" is incorrect; the German original is to the effect that the boy had already suffered for some months from dysentery. The error appears to be due to the word "for" having dropped out before "some months" and to the omission being overlooked in proof reading.

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CONTENTS.

PROTOZOOLOGY.

PAGE.

Noc & Stevenel : Intestinal Flora of *S. fasciata* 511
Laveran & Marullaz : Protozoal Parasites of the Japanese Nightingale 511
Ringenbach : Blood Parasites from the Congo.. 512
Nawrotzky : Blood Parasites from Fish 513
Hetzer : Protozoa of the Human Intestine 513
Lagane : Pathogenic Protozoa of Man 514
Noc : The Prolonged Vitality of Protozoa 514
Woodcock & Lapage : A Parasite of Ruminants 515
Laveran & Franchini : The Infection of Rats and Mice by Flagellates of the Rat-flea (Herpetomoniasis) 515
Woodcock : The Flagellate Parasites of Culex 517
Kuczynski : The Trichomonads.. 517
von Wasielewski : Halteridium Disease of Birds 517
Wolbach : A Hemogregarine found in a Monitor 518
Sangiorgi : A Leucocytogregarine of a Rabbit 519
Carini & Maciel ; Sarrailhé ; Arantes ; Migliano : Toxoplasmosis 519-521
Castellani ; Plate : Protozoa-like Bodies found in the Spleen. (Figure) 521
Laveran & Marullaz ; Galli-Valerio : Graham-Smith Bodies and Parasites of the Mole 522-523
Delanoë (M. & Mme.) *Pneumocystis carinii* and Trypanosomes 523
Acton & Knowles ; Schilling-Torgau ; Schulhof : Kurloff Bodies 524-525

SLEEPING SICKNESS.

German East Africa : Sleeping Sickness in German East Africa 527
D'Almeida : Case of Trypanosomiasis 527
Macfie : The Pathogenicity of the Human Trypanosome of Southern Nigeria 528
Mouchet & Dubois : Treatment of Human Trypanosomiasis in Belgian Congo 529
Halberstaedter : Treatment of Experimental Animals with Mercury and Salvarsan 530
Danysz : Treatment of Experimental Animals with Salts of Silver and Arsenic 531
Yorke & Blacklock : Treatment by Antimony Trioxide .. 532
Cohn : Quinine Compounds in Experimental Trypanosomiasis.. 533
Yorke & Blacklock : Observations on a Serum for Trypanosomiasis.. 534
Carini & Maciel : *T. cruzi* Infection in Brazil 534
Blacklock : *T. cruzi* and *Cimex lectularius* 535
Watson : Serum Reactions and Serum Diagnosis of Dourine .. 536
Oehler : The Dimorphism of *T. brucei* 539
Delanoë : Variations in Virulence of *T. dimorphon* 540
Hagemeister : Cultivation of Trypanosomes in Artificial Media 541
Brown : The Pathogenicity of *T. lewisi* 542

KALA AZAR.

WENYON: Kala Azar in Malta 543
LIGNOS: Kala Azar in Hydra 544
PITTALUGA: Kala Azar in Spain 544
CONOR & CALÔ: Kala Azar in Algeria 545
CANNATA: The Presence of Leishmania in the Peripheral Blood 545
WHIPHAM: Indian Kala Azar in a Child 545
GABBI; LAVERAN: The Identity of Mediterranean and Indian Kala Azar 545-546
DA SILVA: Researches on Kala Azar 547
SALVATORE: Inoculation of Dogs with Human Leishmania .. 550
WENYON: The Culture of Leishmania from the Blood in Indian Kala Azar and the Nature of Certain Granular Bodies .. 550
PRICE & ROGERS: Segregation Measures in the Eradication of Kala Azar 552
PRINGAULT; LAVERAN: Canine Leishmaniasis at Marseilles .. 554
CARONIA & DI GIORGIO: Canine Leishmaniasis at Palermo .. 555
LEMAIRE, SERGENT & LHÉRITIER: Canine Leishmaniasis at Algiers; Keratitis as a Sign 555-556
YAKIMOFF & SCHOKHOR: Canine Leishmaniasis and Canine Tropical Sore in Turkestan 556
PEDROSA: Canine Tropical Sore in Brazil 557
CHATTON: Tropical Sore in Tunis.. 557
FOLEY, VIALATTE & ADDE: Tropical Sore in South Morocco .. 558
JEANSELME; WAGON: Tropical Sore treated with Salvarsan .. 558
GIUGNI: Blood Examination in Tropical Sore 559
BARBARA: Tropical Sore in Sicily 559
HUNTEMÜLLER: The Parasite of the Jericho Boil 560
ROW: Generalised Leishmaniasis induced by *L. tropica* .. 561
GAUCHER & BLOCH; JEANSELME: Tropical Sore and the Wassermann Reaction 561
McEWEN: Tropical Sore in the Americas 561
CARINI: Tartar Emetic in the Treatment of South American Tropical Sore 561
GORGA: Tropical Sore in Brazil 562
GUERREIRO: The Bordet-Gengou Reaction in Tropical Sore .. 562

TYPHUS.

SERGENT, FOLEY & VIALATTE: Typhus transmitted by Lice from a Patient with Relapsing Fever 563
DAY: Typhus in New Mexico 564
FRAENKEL: Cutaneous Eruption in Typhus and Typhoid .. 564
MARKL: Ship Typhus 564
OUFTUGEANINOFF: Treatment by Iodine 565
IOUDINE; GOLDBERGER: The Prevention of Typhus 565-566

BOOK REVIEWS.

CRAWFURD: Plague and Pestilence in Literature and Art .. 567
SCHILLING-Torgau: Ausgewandte Blutlehre für die Tropenkrankheiten, [MENSE's Handbuch].. 567
LUDLOW: Disease-Bearing Mosquitoes of America, the West Indies and the Philippine Islands 570
ERRATUM 570